



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### **Usage guidelines**

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### **About Google Book Search**

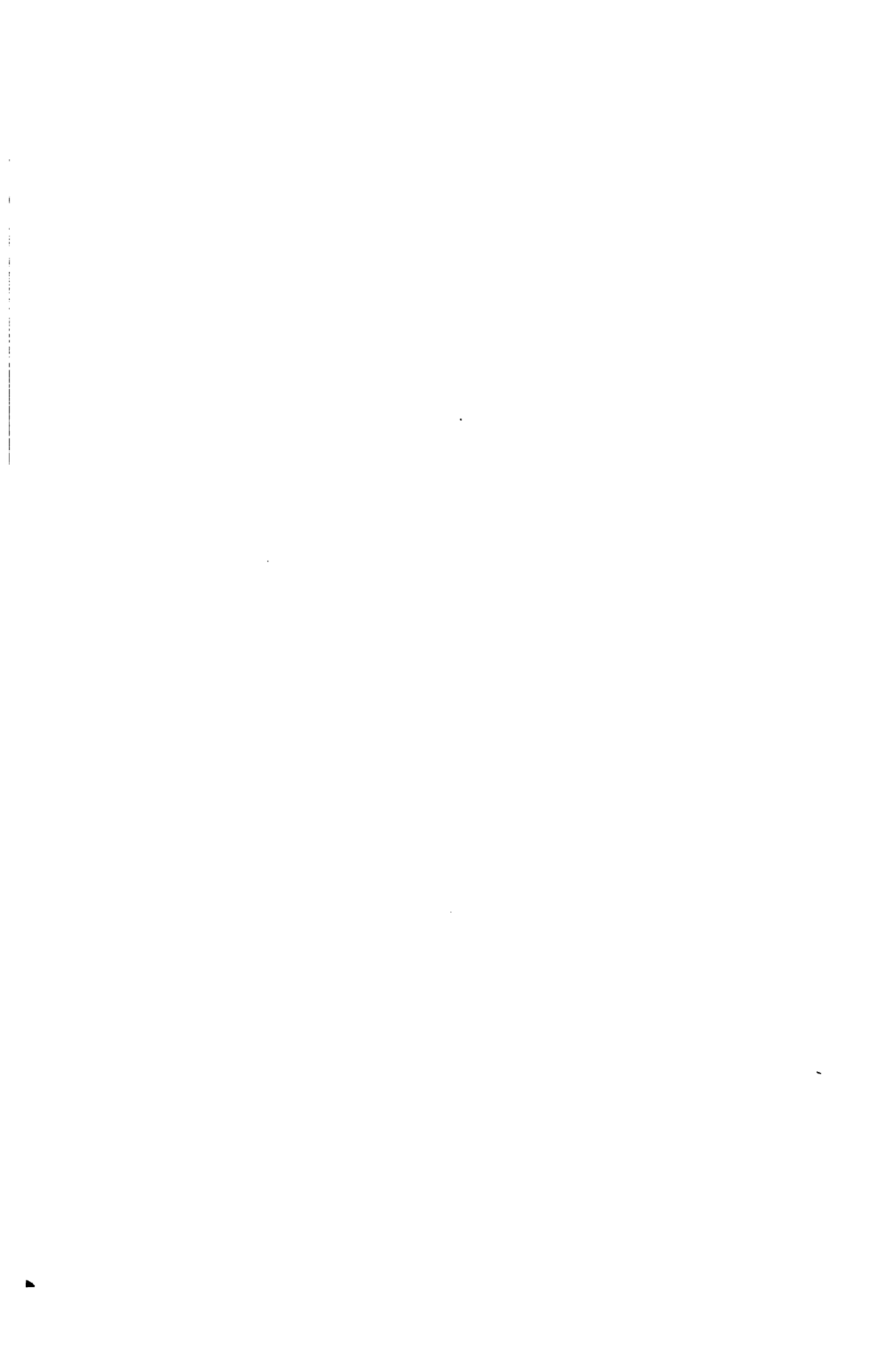
Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

B 50518 3









THE  
INDUSTRIES OF RUSSIA



414028

MANUFACTURES AND TRADE

WITH A GENERAL INDUSTRIAL MAP

BY THE

DEPARTMENT OF TRADE AND MANUFACTURES MINISTRY OF FINANCE

FOR THE

WORLD'S COLUMBIAN EXPOSITION

AT

CHICAGO

EDITOR OF THE ENGLISH TRANSLATION

JOHN MARTIN CRAWFORD

U S CONSUL GENERAL TO RUSSIA

Russia, *Ministerstvo finansov.*

Vol I

ST PETERSBURG  
1893

HC  
335  
.R97

~~~~~  
Published by the Department of Trade and Manufacture Imperial Ministry of Finance.  
~~~~~

~~~~~  
TRENKE & FUSNOT, Printers, Maksimilianovsky Per., 13.  
~~~~~

## PREFACE.

---

In order to properly celebrate the 400th anniversary of the discovery of the New World, the Congress of the United States of America in session at Washington resolved to arrange an international competition in the peaceful arena of industry and trade, and for which purpose the World's Columbian Exposition, named in honor of the great hero and discoverer, is now open at Chicago.

Russia, inspired with a long-felt sympathy, tending to unite the American and Russian peoples, has answered with the liveliest interest the invitation of the friendly Government of the United States, and has taken part in the great Exposition by sending various exhibits to represent the principal industries of the Empire.

The Minister of Finance, to whom His Imperial Majesty, the Emperor, deigned to entrust the care of the organization of the Russian Exhibit, could but recognize the fact that, however successful the choice of exhibits may be, they cannot convey an adequate idea of the productive forces of the Empire and its industrial development. To obtain such a view requires a more intimate acquaintance with the conditions under which our

commercial activity began. With this fact in full view, and stimulated by the desire to give the visitors to the World's Columbian Exposition a more correct and fuller representation of the contemporary state of the trade and industry of Russia. His Excellency, Mr. S. J. Vitte, Imperial Minister of Finance, at the close of the past year, instructed the Department of Trade and Manufactures to make a general review of the principal branches of the most developed industries of Russia, and of the internal and foreign trade, as well as of the customs policy.

To accomplish this very difficult task in the brief time allotted, the Department of Trade and Manufactures invited specialists in the several commercial and industrial departments to assist in the preparation of such a review, having entrusted the editing of the work in the Russian language to the worthy Professor of the St. Petersburg University, D. I. Mendeléeff, whose literary services are well known in the Old and in the New World.

The translation of this work into English was fraught at the beginning with very great difficulties, as there were no translators at hand who knew English and Russian sufficiently well and who were at the same time thoroughly acquainted with the technical terms of the several industries under consideration. Furthermore, skill and experience in writing were requisite to think out and select the proper expressions correctly to represent in English the many idiomatic and technical meanings of the several Russian authors. All these difficulties, however, were happily overcome through the kindness of the Consul-General of the United States, Mr. J. M. Crawford, who consented to supervise and edit the entire series of volumes on *The Industries of Russia*, embracing more than 1600 large octavo pages. Still further, is gratitude due to the Consul-General that he willingly undertook this very difficult task knowing that the time necessary for its accomplishment was exceedingly short. Nevertheless, the end has been attained, thanks to the fact that Mr. Crawford is thoroughly familiar with the Russian language and is also,

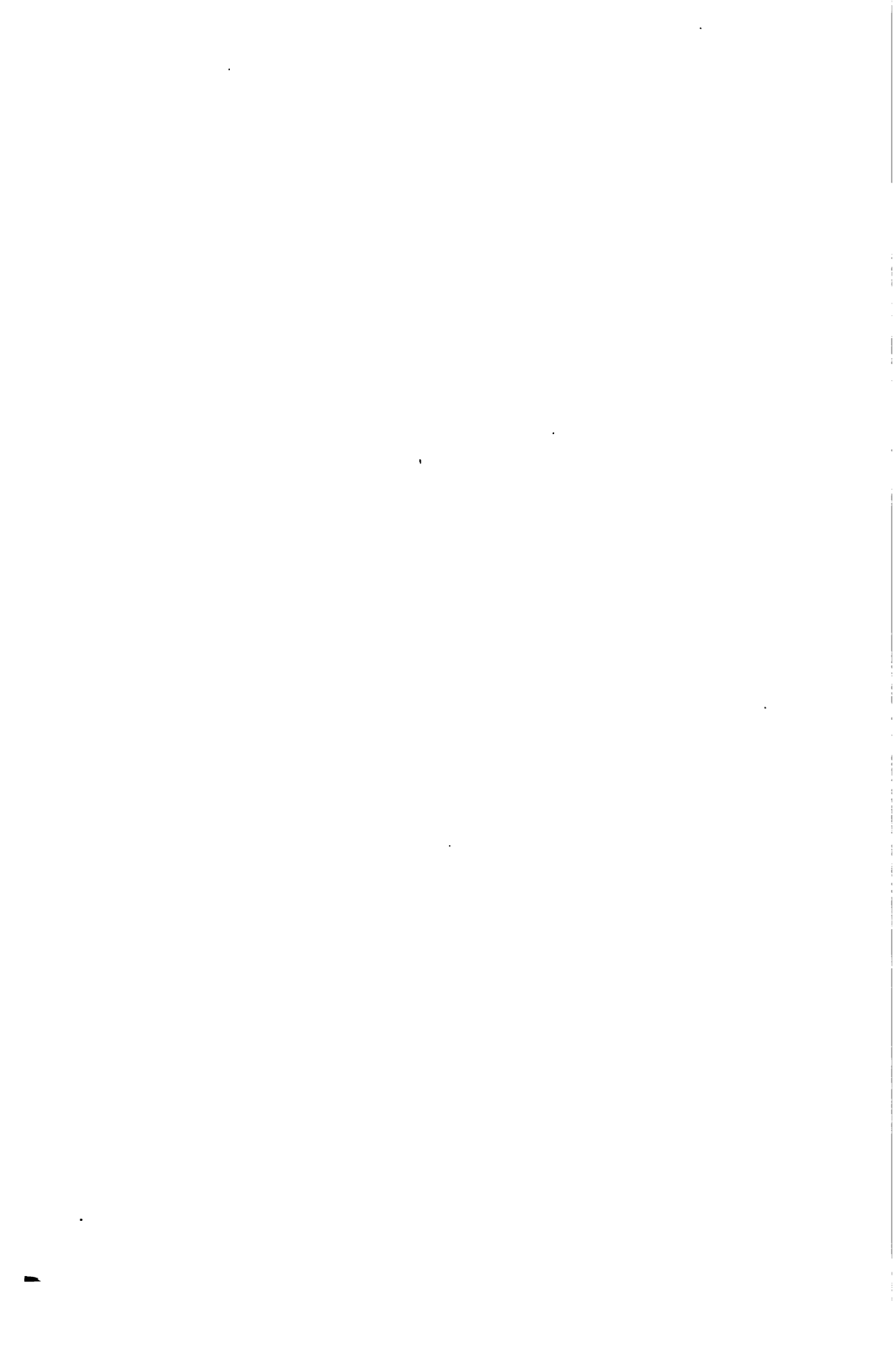
through his literary training and large experience, well acquainted with the several technical branches of industry included in this review. This enormous work is now drawing to a close; the first volume of *The Manufactures and Trade of Russia* is here presented, and the second is in press, while a third volume, on *Siberia*, is nearly ready.

The condition of the remaining branches of Russian Industry, the review of which is not included in these volumes, is represented in editions of other Departments. Thus, the Ministry of Crown Domains publishes a volume on *The Mining Industry*, a second volume on *Agriculture and Forestry*, and the Ministry of Ways of Communication, a *Review of the Railway and Steamboat Lines of the Empire*.

**V. I. Kovalevsky,**  
Director, Department  
of Trade and Manufacture.

St. Petersburg, June 12, 1893.





## PREFACE

TO

THE ENGLISH TRANSLATION.

---

Ever since becoming established at this post of the Consular Service, I have had a constant stream of inquiry from all branches of trade in the United States with reference to its especial development in Russia, there being no publication in the English tongue covering these subjects, and but few of our people having a sufficient knowledge of the Russian language to glean from the native literature the information desired.

In accepting, therefore, the invitation of the Imperial Minister of Finance to supervise and edit the English translation of *The Industries of Russia*, in its several volumes, I have undertaken the serious labour involved in such a work, not only with very great pleasure but also as an important duty, thus aiding to give the American people an insight into what is to them, commercially speaking, an unknown country.

In this, and in the volumes that immediately follow, a complete summary of Russian industries is impartially and accurately set forth, with the history of their growth from the earliest beginnings, together with the methods whereby Trade, Agri-



culture and Forestry have been advanced and improved until the present day.

To His Excellence, Mr. Vladimir Ivanovich Kovalevsky, Director of the Department of Trade and Manufactures, Ministry of Finance, Actual Councillor of State, and President of the Imperial Russian Commission, World's Columbian Exposition, is due the credit and honour of elaborating the original idea of the Imperial Minister of Finance with reference to this work, and of drawing the entire plan, of superintending it in all its details, and of ably carrying it to completion.

In this translation I have made an effort to follow a uniform plan, and to harmonize, as far as limited time would permit, the varying stiles of treatment and of expression found in the originals of the many authors who have prepared the articles on their several specialties. It has been my aim and endeavour to modify and, as far as practicable, correct the English orthography of many Russian names. To this end the compound consonants of the Russian alphabet have been uniformly rendered into English, and as simply as possible; furthermore, all case and gender endings have been dropped, especially of adjectives, as being of no value in English. For example, such adjectives as in the Russian designate the genders in *ской, ская, кое* (*scoi, skaia, scoie*) have been shorn of their terminal vowels, and the reader will find, in consequence, such expressions as *Tambovsk* government, instead of the varying forms found in other English books, *Tambovskoi, Tambowsky, Tambovskoy, Tambovski* government. However, in the cases of old and very familiar Russian words that have become stereotyped in English literature in false dress, as *Moscow* for *Moskva*, *Archangel* for *Arkhangelsk*, *Ekaterinburg* for *Yekaterinburg*, they have been retained. Even that impossible, and therefore unpardonable spelling, *Nova Zembla* for *Novaia Zemlia* (New Land) will be found in this work in its old but false orthography. By special request that numerous class of words universally spelled in the United States with the termination *or*, as also that class ending in *er*, are written in

this work in *our* and *re*, according to the so-called English orthography.

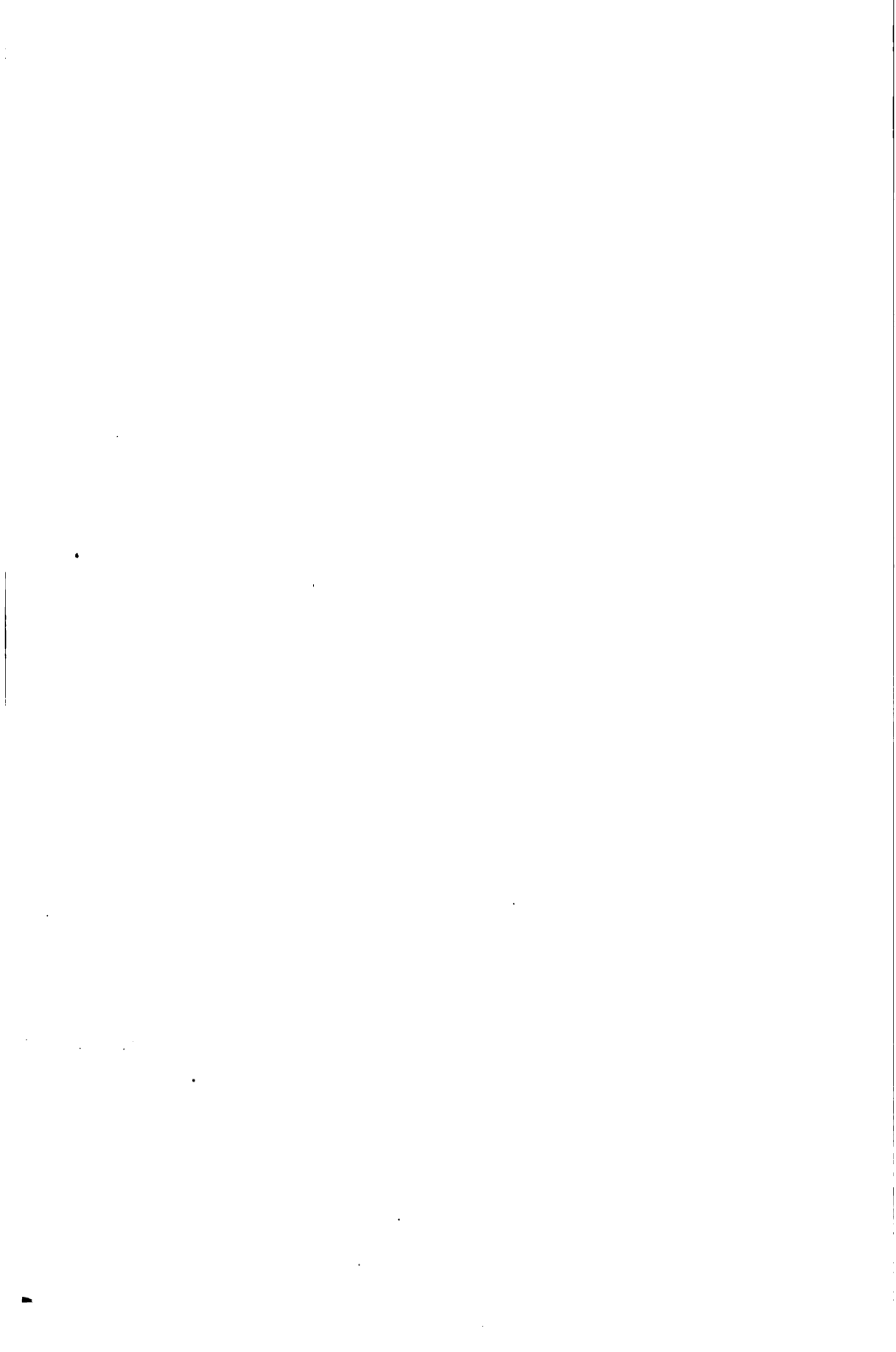
The many imperfect sentences and positive errors that must inevitably be found in the pages of this, and of the succeeding volumes, should not be charged in the least to the original authors, but rather to the great difficulties under which the translations have been made. These difficulties may be faintly imagined when it is considered that the Russian text has been penned by very many specialists, with styles of composition as various as the subjects on which they have written, and that the typographical work has been done by casemen who have no knowledge of the language which they were setting up. The necessity for very rapid work, in order to present these volumes for distribution to the American public during the continuance of the World's Fair at Chicago, has also permitted many errors and inaccuracies, lying in full view, to escape correction.

While, therefore, begging the indulgence of the reader as to details, I can but feel that these volumes as a whole, because of the important and authentic information which they contain on the several industries of Russia, will be of inestimable value to the international trade of Russia and the United States, and if so, I shall feel amply rewarded for the labour and time spent on this work.

**J. M. Crawford.**

St. Petersburg, June 27, 1893.





# INDEX OF AUTHORS

AND

# CONTENTS.

|   | Page. |
|---|-------|
| PREFACE . . . . .   | III   |
| PREFACE TO THE ENGLISH TRANSLATION. . . . .   | VII   |
| RUSSIAN WEIGHTS AND MEASURES . . . . .  | XIV   |
| INTRODUCTION. <b>Review of the Manufactures and Trade of Russia</b> , by D. I. Mendeléeff, Emeritus Professor, St. Petersburg University . . . . .  | I     |
| <p>The Central or Moscow Region; the Baltic and St. Petersburg Region; Finland; the Northern Region of European Russia; the Eastern Region of European Russia; the Siberian Region; the Central Asiatic; the Caucasus; the Southern Region of European Russia, adjacent to the Caspian, Azov and Black seas; the South-western Region; the Vistula or Polish Region; the North-western Region; the Little Russia Region; the Central Grain, or Chernoziom Region.</p> |       |
| CHAPTER I. <b>Cotton Goods</b> , by N. Langovoy, Professor, St. Petersburg Technological Institute . . . . .  | 1     |
| <p>Historical review of the industry; quantity of cotton consumed, its classification and quality; the yearly returns of the industry; technical means of manufacture; comparison of Russian and foreign industries; characteristics of the trade; cost of production of cotton manufactures; prices of cotton and cotton manufactures.</p>   |       |
| CHAPTER II. <b>Flax, Hemp and Jute Goods</b> , by N. P. Langovoy, Professor, St. Petersburg Technological Institute . . . . .   | 22    |
| <p>Historical sketch of the flax and hemp industries; the quantity of material used, and its properties; the import of foreign goods into Russia; the technical resources of the trade.</p>   |       |

|   | Page. |
|---|-------|
| CHAPTER III. <b>Woollen Goods</b> , by N. P. Langovoy, Professor, St. Petersburg Technological Institute . . . . .  | 38    |
| Historical review of the industry; raw material, and its qualities; import of foreign goods; yearly turnover, and technical means of the trade; conclusion.   |       |
| CHAPTER IV. <b>Silk Goods</b> , by N. P. Langovoy, Professor, St. Petersburg Technological Institute. . . . .   | 58    |
| Historical sketch of the industry; the import and export of silk goods.   |       |
| CHAPTER V. <b>Paper Industry</b> , by B. T. Vylezhinski, Professor, St. Petersburg Technological Institute . . . . .  | 66    |
| Historical review; progress of the industry; import of paper; export of paper; export of paper goods; home consumption.   |       |
| CHAPTER VI. <b>Leather Goods</b> , by B. T. Vylezhinski, Professor, St. Petersburg Technological Institute. . . . .   | 80    |
| Historical review of the industry; import of leather goods; leather export trade; varieties of leather dressed in Russia; tanned leather; tawed leather; chamois leather; the village leather industry.   |       |
| CHAPTER VII. <b>India-Rubber Trade</b> , by B. T. Vylezhinski, Professor, St. Petersburg Technological Institute. . . . .   | 104   |
| Historical review; the progress of the industry; soft rubber and gutta-percha goods; horn-rubber goods.   |       |
| CHAPTER VIII. <b>Wood Industry</b> , by A. A. Press, Technological Engineer . . . . .   | 109   |
| The historical review of the industry; the wood-working trade; the pitch and tar manufacture.   |       |
| CHAPTER IX. <b>The Metal Industries</b> , by N. F. Labzin, Emeritus Professor, St. Petersburg Technological Institute. . . . .  | 126   |
| Historical review; products of the noble metals and jewelry; wares in copper and copper alloys; articles in zinc, tin, lead, and their alloys; blacksmith goods, and articles of sheet iron; manufactures of cast iron and steel; guns, artillery supplies, ammunition and firearms; side arms and cutlery; implements for working various materials; scythes and sickles; wire and wire goods; locks, handles, and other locksmith manufactures. |       |
| CHAPTER X. <b>Machines and Implements</b> , by P. A. Afanassiev, Professor, St. Petersburg Technological Institute. . . . .   | 177   |
| Historical review; the principal factories in Russia; measures taken for the development of machine building.   |       |
| CHAPTER XI. <b>Glass Wares</b> , by A. K. Kroupski, Professor, St. Petersburg Technological Institute. . . . .  | 188   |
| Historical review of the industry; the development of special branches of glass manufacture; the value and prices of different glass wares; the import and export of glass; the movement of the trade during recent years.  |       |
| CHAPTER XI. <b>Ceramics</b> , by A. K. Kroupski, Professor, St. Petersburg Technological Institute . . . . .  | 200   |
| Historical sketch; the production of stone ware; of enamelled majolica; the making of fire bricks; principal factories in the different parts of Russia; import, export, and consumption.   |       |

|   | Page. |
|---|-------|
| <b>CHAPTER XIII. Chemical Industry</b> , by D. I. Mendeléeff, Emeritus Professor, St. Petersburg University . . . . .                             | 225   |
| The development of the industry in dependence upon other branches of trade; the import of chemical products; the manufacture of illuminating gas. |       |
| <b>CHAPTER XIV. Manufacture of Matches</b> , by V. N. Andréev, Tax Reviser . . . . .  | 239   |
| Historical sketch; development of the industry; the production of phosphorus.   |       |
| <b>CHAPTER XV. The Naphtha Industry</b> , by D. I. Mendeléeff, Emeritus Professor, St. Petersburg University . . . . .                            | 248   |
| The amount of naphtha obtained from 1870 to 1892; historical sketch; the Baku naphtha products; American naphtha.                                 |       |
| <b>CHAPTER XVI. Cement Trade</b> , by A. K. Kroupski, Professor, St. Petersburg Technological Institute. . . . .                                  | 269   |
| Historical sketch; contemporary state of the industry; import of cement.  |       |



## Russian Weights and Measures.

---

The following tables will serve to define the Russian weights and measures in terms of the French Metric System, as also in those which are used in the United States.

### I. LONG MEASURE.

The lineal measures of Russia have for a unit the *foot*, which, according to the laws of Peter the Great, is the same as the English foot.

- 1 Russian foot = 1 English or United States foot.
- » = 12 inches = 120 lines = 1,200 points.
- » = 0.304794 metres = 30.4794 centimetres.
- 1 Russian arshine = 16 vershocks = 28 inches.
- » =  $2\frac{1}{3}$  feet =  $\frac{7}{9}$  or 0.77778 yards = 0.71118 metres.
- 1 Russian sagene = 7 feet = 3 arshines.
- » = 2.13356 metres = 213.356 centimetres.
- » = 2.333 yards.
- 1 Russian verst = 500 sagues = 3,500 feet.
- » = 1066.77 metres = 1.06677 kilometres.
- » = 0.66269 English miles.
- 1 geographical mile = 6.956 versts = 7.420 kilometres.
- » = 4.601 English miles.

### II. SQUARE MEASURE.

- 1 square sagene = 49 sq. feet = 4.5521 sq. metres.
- » = 5.4444 sq. yards.
- 1 dessiatine (Russian land measure) = 2,400 sq. sagues.
- » = 1.0925 hectares = 2.6997 acres.

- 1 square verst = 250,000 sq. sagues = 104.17 dessiatines.  
 > = 1.1380 sq. kilometres.  
 > = 0.43916 sq. English mile.  
 1 sq. geographical mile = 48.38 square versts.  
 > = 55.06 > kilometres.  
 > = 21.25 > English miles.

## III. CUBIC MEASURE.

- 1 cubic inch = 16.386 cubic centimetres.  
 1 cubic sagene = 343 cubic feet.  
 > = 9.712 cubic metres.  
 > = 12.704 cubic yards.

*Dry Measure.*

- 1 chetvert = 8 chetveriks = 2.099 hectolitres.  
 > = 5.9567 bushels.  
 1 chetverik = 8 quarts = 1601.22 cubic inches.  
 > = the volume of 64 Russian pounds of water at  $13\frac{1}{3}^{\circ}$  R. temperature.  
 > = 26.238 litres = 0.26238 hectolitres.  
 > = 0.7446 bushels.

*Liquid Measure.*

- 1 vedro =  $\frac{1}{40}$  of a barrel = 10 shtoffs or krouzhki = 750.57 cubic inches = volume of 30 Russian pounds of water at  $13\frac{1}{3}^{\circ}$  R. temperature.  
 > = 12.299 litres.  
 > = 2.707 English, or 3.249 American gallons.

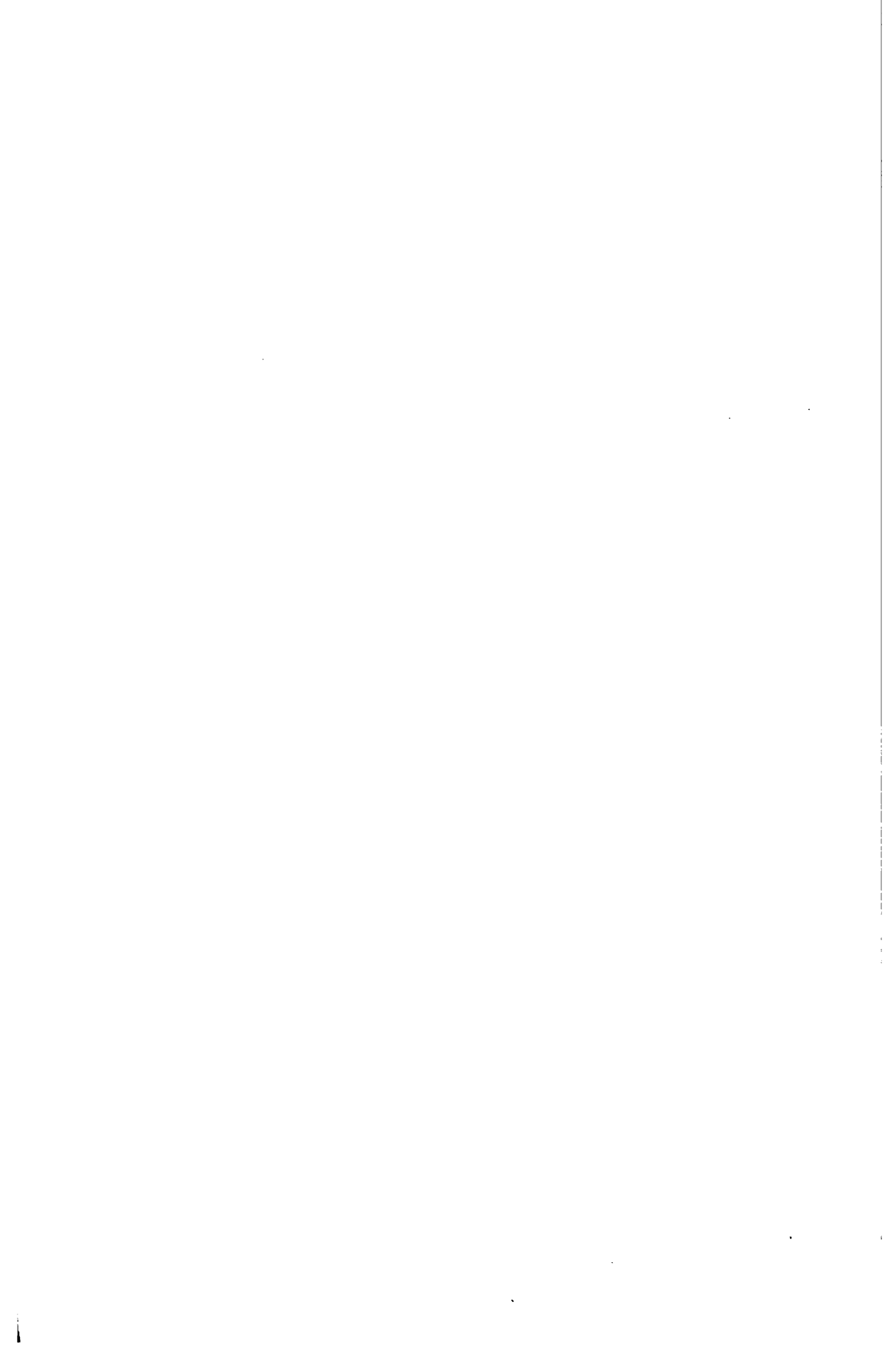
## IV. AVOIRDUPOIS WEIGHT.

- 1 berkovets = 10 pounds = 0.1638 metric tons = 163.80 kilograms.  
 > = 0.161217 English tons = 3.2243 cwt.  
 1 pound = 40 Russian pounds = 0.01638 metric tons = 16.380 kilograms.  
 > = 0.32243 cwt. or 32.243 Eng. lbs.  
 1 Russian pound = 32 lots = 96 zolotniks = weight of 25.019 cubic inches of water at  $13\frac{1}{3}^{\circ}$  R. in vacuo.  
 > = 0.40951 kilograms = 409.51 grams.  
 > = 0.90282 English pounds.

*Troy Weight.*

- 1 zolotnik = 96 dolee.  
 > = 4.2657 grams.  
 > = 65.830 grains, Troy.





## INTRODUCTION.

### Review of the Manufacturing Industry and Trade of Russia.

**T**HE Russian branch of the Slavonic peoples, occupying from immemorial times as colonists the western half of the immense plain stretching for two and one-half thousand kilometres from the rocks of Finland to the mountains of the Caucasus, and from the Carpathians to the Urals, from necessity, from the rapidity of its natural increase, from its inclination to peaceful domestic occupations, and finally from its habit of struggling against the difficulties presented by nature, has ever been mainly occupied with agricultural pursuits. Trade relations were assisted by the vast rivers and the winter sledge roads, but were hindered by the lack of seacoast, extensive forests, the raids of the tribes of Finnish and Mongolian descent, and the internal disorder which caused the people in the ninth century to elect princes whose chief care consisted in the establishment of internal organization and external defense from those neighbouring tribes which had partly fallen away from, partly been assimilated by Russia. The division of the country into many separate principalities, the warring of the princes, the imposition for two centuries of the Mongol yoke, the ceaseless defensive wars undertaken against the Swedes and the Teutonic knights pressing on from the north-west, against the Poles who had deprived Russia of her western and south-western territories, and against the Tartars who attacked her from the east and south-east, all this occupied the Russian people even in the fourteenth, fifteenth and sixteenth centuries to such an extent that there was little possibility of beginning any lasting industrial development. Only in the seventeenth century the Moscovite Tsars, after uniting the people and strengthening their authority with the aid of the most enterprising inhabitants of the Moscow region, were in a position to present stout resistance to the west, and having finally broken the force of their eastern enemies, were able to begin to think about the

development of Russian trade and industry. Opening with the great reforms of Peter the Great, the eighteenth century already brings Russia into the circle of nations with a trading and industrial organization. But these efforts were opposed by the wars with the Swedes, ending with the occupation of the Baltic provinces, the wars in the south for pushing back the Turks who had already succeeded in seizing the northern shores of the Black Sea and the territories of the related Slaves, and the ceaseless extension to the east, where unorganized Asiatic hordes long prevented the establishment of peace and order to which the Russian people ever strove, and which it attained so lately. The beginning of the nineteenth century bears the same character in consequence of the invasion by Napoleon, the Turkish wars and the forcible introduction of an orderly rule in the Caucasus and the Central Asiatic territories, where it was impossible to permit the constant raids upon the country and rapes of the inhabitants by petty Asiatic rulers. At this time trade relations with the west began to develop principally in agricultural raw materials, the production of which visibly increased in proportion as order was established, and to such an extent that the surplus of grain, hemp, flax, timber and wool, chiefly from the Chernoziom zone of Russia, began to be sent in abundance to the markets of Western Europe, and furnished grounds for regarding Russia as an exclusively agricultural country, a view justified by the whole structure of Russia's past existence.

Although the Government, and a few enlightened people, made great efforts to establish in Russia various forms of mining and manufacturing industry, and although the rapid development, at the time, of certain works and manufactories, for example, the metallurgical works in the Urals, the factories around Moscow, the beet industry near Kiev, the petroleum industry in Baku, demonstrated the combination of conditions existing for the purpose in Russia, nevertheless the industrial development of the Empire moved very slowly and yielded not only to the other aspects of the growth of Russia's forces, for example, the development of science, the advances of literature, music and painting, the increase of the means of warlike defense, but also to the growing demand for articles of foreign production. As an illustration of the latter, may be taken the import of wine which in 1850 amounted to seventy-six million roubles across the west European frontier, while in 1875 it reached five hundred and twelve million roubles, or an increase in twenty-five years of nearly 700 per cent.

The chief cause of the feebleness of the development of the home manufacturing industry consisted for a long time in the whole organization of former Russian life, which was concentrated in the peasantry, which directed all its energies to agricultural productions and employed for the attainment of this object only the means which lay at hand, such as the replacement of lands exhausted by cultivation by fresh lots, home-made implements and the felling of forests. The rural gentry, or large landholders, having serf labourers bound to them, employed them also mainly in the cultivation of the land and, like the peasants, strove to satisfy their wants as far as possible from their domestic resources, only having recourse to the productions of manufacturing industry as a luxury. Thus houses were built chiefly of wood from their own estates by their own carpenters, who had attained extraordinary skill in their trade. Clothing also was in the main woven from home-grown flax and wool or made from home furs and skins. In the matter of food the people confined themselves so strictly to

their domestic resources that the preparation for winter of various preserves, beginning with salted and soured vegetables and ending with the making of confectionery and sparkling drinks, formed part of the business of every well to do household. This patriarchal state of domestic economy, preserved with due reverence for the old order of things, here and there to this day prevailed over the whole country even in the middle of the present century. There was thus little room for the demand for the products of manufacture, a fact which till now serves as the chief explanation of the feeble development of the latter in the Empire. All that there is in this respect is almost entirely new. Mills and manufactories first appeared in those places where, from the growth of the population and from the exhaustion of the soil or the want of land, the conditions permitting of the indefinite preservation of the beloved patriarchal system were disappearing. Particularly, and earlier than anywhere else, was this the case in localities situated near Moscow, where there is already a very dense population. In that government for example, more than 2,250,000 inhabitants live upon an area of 33,300 square kilometres, or about 68 inhabitants to the square kilometre\*. At the same time the dwellers in the central or Moscow region of Russia have been distinguished in all respects from the earliest times by the greatest enterprise, and have always been to the fore in seeking out new roads for the lasting development and strength of their country. With the increase of population in this heart of Russia, for a long time and even to-day, the surplus had colonised the more distant districts of the Empire, but notwithstanding this, here earlier than elsewhere, appeared the conditions necessary for the springing up of mills and manufactories requiring unemployed labour, no longer satisfied with agriculture alone. Accordingly the neighbourhood of Moscow has become the centre for the free and independent growth of many kinds of manufactories and works, where also have been situated from ancient times the centre of Russia's trade relations, not only with the interior but also with foreign countries and especially with Asia.

The present volume is intended to acquaint our country's friends in the United States, and those visiting the World's Columbian Exposition, with the economic life of Russia. The conditions then which favoured the visible growth, or at times, as in the case of sugar and petroleum, the very origin of manufacturing industry, began to appear and improve principally in that period of the sixties and seventies, when the serfs were emancipated from forced labour, and the active construction of the system of Russian railways was begun. The causes of the close connection between these internal reforms and the demonstrations of the necessity for the development of mills and manufactories are numerous. The most important cause must be accounted, that the land began to be tilled by free labour and consequently this labour became more productive than before, and a number of people accordingly appeared seeking for wares, outside of agriculture, although all the peasants had received land allotments, and although the lands of the landholders, both by way of lease and by hired labourers, were brought under more thorough tillage. This latter circumstance was still further helped by the railways which gave an outlet abroad to the grain surplus of many remote regions of Russia. Almost an equal importance is ascribable to certain other causes,

---

\* For comparison be it observed that in Germany there are about 49.5 million inhabitants to 541 thousand square kilometres, or 91 inhabitants to one square kilometre.

among which was the increased demand of all classes of the population for manufactured articles, especially leather, glass, iron, kerosene. Next came the increase of free capital, called forth by the development of banking operations, founded on the issue of land-redemption certificates, or the mortgaging of land and houses, and the circulation of various shares and bonds, a practice until then very rare in Russia. Lastly, must be noticed the propagation of the manners and customs of the towns over the whole country now intersected by railways, whose appearance gave an impulse to every kind of exchange.

The growing demand for manufactured articles in its turn helped to give life to railway enterprise, but the latter did not show the energy that might have been expected. This circumstance depended in the first place upon the fact Russia's customs tariff, which had been in operation during the period 1857 to 1877, when the internal demand had become very brisk, protected only that which had received its initial development earlier than that period, for example manufactures, or fostered only the working up of raw materials, admitting without duty, sometimes with low fiscal dues, raw and half-manufactured goods, such as cast iron, steel, cotton, sulphur and coal. The mills and manufactories which sprang up at that time frequently had the character of finishing works. They received all the chief raw and half-manufactured materials from abroad and completed their manufacture in Russia, in order to profit by the advantages presented by the protective tariff on finished goods. As an example, may be taken the working up of foreign cast iron into iron and steel rails and the making of cement with the aid of foreign lime and coal on the seacoast. This cause of development of the mills and manufactories was the more faulty because the products obtained from foreign raw material had not the capacity for becoming cheaper, yielded the people but little wages, hindered the development of internal productive industry and, in general, contributed little to the industrial progress of the country. Nevertheless these manufactories, together with the increased demand arising among the people on their passage from their formal patriarchal life to one more complicated, and with greater requirements in reference to manufactured goods, and the construction of railways referred to above, served to throw a certain amount of animation into the whole manufacturing enterprise of Russia, a movement which dates from the seventies. This industrial life became evident with the year 1877. when on account of the needs of the treasury, and later when in the interests of the development of the home industries, the customs duties began to be raised as compared with those which in the sixties were thought to answer to the internal demand, aided by foreign importation. In order to form a more just opinion of the importance of customs duties in the interest excited in the last fifteen years in Russia's manufacturing activity, it is necessary to become acquainted with the particulars relating to the protective policy of the country, set forth by the Vice-Director of the Department of Trade and Manufactures, V. J. Timiriazev, in the Chapter upon the Customs Policy of Russia, and in the Chapter by A. J. Stein, Chief of the Statistical Section of the Department of Customs Duties, upon the Foreign Trade of Russia. In this Introduction only a few general facts, founded upon data which depict the situation of Russia in respect to the productiveness of her mills and manufactories, her trade balance and her customs, will be noticed. Seeing that the amount of the latter is closely connected with the conditions which determine the origin of mills and

manufactories a general account of Russian customs should occupy the first place. Attention will first be directed to the fact that the ratios per cent of the total revenue of the State to its customs revenue, and of the value of all the foreign goods imported into Russia to the duties levied, have been continually growing during the last twenty years, although a constant increase is observable in the amount of all sources of revenue and an evident diminution in the quantity of foreign goods imported has already begun, corresponding to the awakening of home production.

TABLE 1.

|                 | Per annum.                 |                       |                           | Ratio per cent of : |             |
|-----------------|----------------------------|-----------------------|---------------------------|---------------------|-------------|
|                 | Mean Imperial revenue *.   | Mean customs revenue. | Mean value of imports **. | B to A.             | B to C.     |
|                 | Millions of paper roubles. |                       |                           |                     |             |
|                 | A                          | B                     | C                         |                     |             |
| 1869—1873 . . . | 477                        | 49                    | 390                       | 10 per cent         | 12 per cent |
| 1874—1878 . . . | 554                        | 66                    | 484                       | 12                  | 14          |
| 1879—1883 . . . | 668                        | 94                    | 573                       | 14                  | 16          |
| 1884—1888 . . . | 734                        | 109                   | 438                       | 15                  | 25          |
| 1889—1891 . . . | 834                        | 136                   | 411                       | 16                  | 33          |

In order that the preceding figures may obtain, the comparative value of the corresponding figures for the period between 1887 and 1889 for different countries should be contrasted:

TABLE 2.

|   | Millions. |     |      | Ratio.      |             |
|---|-----------|-----|------|-------------|-------------|
|   | A         | B   | C    | B : A       | B : C       |
| 1887—1888. Argentine Republic, dollars. . . | 54        | 39  | 117  | 72 per cent | 33 per cent |
| 1886—1889. Brazil, milreis. . . . .         | 139       | 84  | 209  | 60 „        | 40 „        |
| 1888. Great Britain, pounds sterling.       | 90        | 20  | 387  | 22 „        | 5 „         |
| 1887—1889. German Empire, marks . . .       | 865       | 254 | 3189 | 29 „        | 8 „         |
| 1888. France, francs . . . . .              | 3011      | 347 | 4053 | 12 „        | 9 „         |
| 1887—1888. Italy, liras . . . . .           | 1644      | 281 | 1601 | 17 „        | 18 „        |
| 1888. China, taels. . . . .                 | 72        | 21  | 102  | 29 „        | 21 „        |
| 1887—1888. Russia, paper roubles . . . .    | 770       | 124 | 392  | 16 „        | 32 „        |
| 1888—1889. United States, dollars . . . .   | 377       | 217 | 724  | 58 „        | 30 „        |

\* Under revenue, are counted only ordinary revenue of all kinds without reckoning redemption operations.

\*\* The value of imported goods is determined by the declarations of importers, verified and corrected by the Customs Department. As *ad valorem* duties have long since disappeared in Russia, there is no reason to doubt the closeness of the declarations to the truth. The amount of contraband undoubtedly forms but a small part of the imports, and is decreasing every year.

\*\*\* Scott Keltiás, «The Statesman's Year Book for 1889.

Hence it appears that customs revenues in Russia form a smaller part of the ordinary Imperial revenue than in the majority of other countries, while the duties levied upon foreign goods in per cents in Russia reach the extent adopted in the countries of North and South America, that is, in countries with a large home productive capacity for raw materials, but with a small development of manufacturing industry. In the countries of Western Europe on the other hand, the customs duties form a less percentage, namely, 5 to 18 per cent of the value, than in Russia, where the percentage is 32 per cent. The feeble development of manufactories and mills in Russia, the vast natural resources, especially the abundance of mineral, vegetable and animal raw materials, and the surplus of population requiring other sources of wages than agriculture, explain the above phenomenon, both in resemblance to the countries of the American continent and to the variance with the countries of Western Europe.

Furthermore the customs duties of Russia concern, in the main, articles either not forming an indispensable popular demand, as for example, delicacies for the table, articles of luxury, and others, or such as tea which produces twenty per cent of the customs revenue. The latter, like those articles upon which indirect taxes are levied in the form of excise (spirit, sugar, kerosene) are employed in small quantities, and everywhere bear high dues without burdening the consumer. Finally, come those articles which are produced by Russia itself in sufficient quantities to satisfy the growing home demand, as coal, iron, manufactured goods and salt, with the greatest advantage to the inhabitants, seeing that the getting and treatment of these articles furnish the people with wages. But their production cannot be developed if foreign goods are admitted duty free. The great increase in the home production of cotton goods (Chapter I), cast iron, coal, sugar, the products obtained from the treatment of petroleum, and even gutta-percha goods, already exported to Western Europe (Chapter VII), coinciding with the temporary introduction of protective duties, clearly demonstrates the expediency of the application of the principles of protection with the object of rousing the people to strengthen those forms of industry to which the natural resources and forces of the country correspond, precisely at a time when the change has begun from the patriarchal agricultural life to the more complex one, consisting in the combination of agricultural activity with mining and manufacturing industry. The constant growth of the latter is evident from a reference to the change in the annual amount of the values of these products (Table 3). In quoting these data, it is necessary to write the reservation that exact statistical registration can only be expected for such forms of industry as bear special duties, as for example, the getting of gold, platinum and other metals, the production of alcohol and other articles subject to excise. The majority of other kinds of manufactures do not possess special organs for the collection of statistical information, being gathered by the governors through the ordinary police officials, and therefore suffer from incompleteness. This inaccuracy is again increased by the circumstance that the household or small peasant, and indeed all minor forms of production due to the class of half-artisans, occurring in great abundance in different parts of Russia, are utterly incapable of registration. At the same time these scattered industries, as in the case of the manufacture of articles in wood, boxes, wheels, tar, pottery, leather and nails, are occasionally, from the amount of their production, of great importance both for the development of industry in general, and for the prosperity of the population. It should be noticed that the majority of

industries in Russia are free, being subject to but two forms of taxation, namely, the trade license and a tax on income levied per centum, or proportionally. The latter is in effect a peculiar kind of income tax. In reference to the class of products mentioned above subject to taxation or excise, although the quantity produced thus becomes clearly ascertained, their value without excise is liable to fluctuations not easily determined, not unfrequently, especially in the case of spirit, dependent upon the conditions of the payment of excise. The sources of the statistical data set forth below are the detailed official accounts annually published by three Departments, namely, Trade and Manufacture, Excise, and Mining.

TABLE 3.

| YEARS.                     | 1.  | 2.   | 3.                                    | 4.     |
|----------------------------|---|--|---------------------------------------|--------|
|                            | Annual production of non-excise manufactures. | Annual production of excisable manufactures. | Annual production of mining industry. | TOTAL. |
| Millions of paper roubles. |   |  |                                       |        |
| 1878 . . . . .             | 588   | 197  | 120                                   | .905   |
| 1879 . . . . .             | 776   | 213  | 141                                   | 1,130  |
| 1880 . . . . .             | 841   | 216  | 157                                   | 1,214  |
| 1881 . . . . .             | 839   | 294  | 154                                   | 1,287  |
| 1882 . . . . .             | 896   | 329  | 153                                   | 1,378  |
| 1883 . . . . .             | 856   | 344  | 149                                   | 1,349  |
| 1884 . . . . .             | 836   | 320  | 148                                   | 1,304  |
| 1885 . . . . .             | 829   | 335  | 145                                   | 1,309  |
| 1886 . . . . .             | 848   | 323  | 154                                   | 1,325  |
| 1887 . . . . .             | 921   | 348  | 158                                   | 1,427  |
| 1888 . . . . .             | 1,013   | 393  | 166                                   | 1,572  |
| 1889 . . . . .             | 1,028   | 392  | 186                                   | 1,606  |
| 1890 . . . . .             | 1,064   | 403  | 189                                   | 1,656  |

1. The figures in this as in the other columns must be regarded as approximate, exclusive of minor industries. The manufactories and mills included in this column are registered by the Department of Trade and Manufactures. Here enter neither the works whose productions pay excise nor those which produce metals.

2. Under this rubric the production is estimated by the approximate mean values of the articles produced. The values for alcohol and illuminating oils are taken without excise; for the remaining articles, with excise. The products of the naphtha, match and yeast manufactories are shown in totals for all the years, although the excise in the cases was introduced only in 1888. These figures differ from those given in the following tables, for example, the fifth, as certain excises are entered here, as also all the products from the distillation of naphtha.



3. Under this rubric are included, gold, silver, platinum, copper, lead, zinc, tin, cast iron, coal and salt, iron and bronze founding, iron manufactures, steel and rails, while ores of manganese and chromium, sulphur, asphalt, naphtha, porcelain, clay, phosphates, Glauber's salt and iron pyrites have been omitted. The latter were unknown in the previous years and are entered in the total for mining production given for 1890 in the following Table 5.

4. The totals of this table do not include data referring to Finland with the exception of mining. The year 1878 omits the data for Poland. Further, the table does not cover small manufacturing undertakings nor household industry, in consequence of which the actual production is much higher than that stated. Photography, printing, baking and similar industries are also not included in the rubrics of this table, but are to be found in Table 6.

It is exceedingly important to direct attention to the fact that the considerable taxation to which the excitable forms of manufacturing industry are subjected, namely, spirit, sugar, kerosene, matches, tobacco, does not stop the development of these industries. This is seen from the fact that during the thirteen years indicated in the table these productions fully doubled, which is undoubtedly connected with the simultaneous growth of other forms of industry, the latter giving the people the means to pay considerable excise duties, whose annual amount is to be seen from the following figures taken from the accounts of the State Control.

|  | 1882.                      | 1885. | 1888. | 1891. |
|--|----------------------------|-------|-------|-------|
|  | Millions of paper roubles. |       |       |       |
| Spirits, beer and other alcoholic drinks . . . | 253.0                      | 231.3 | 265.1 | 247.4 |
| Tobacco. . . . .                               | 14.8                       | 19.7  | 28.1  | 28.6  |
| Sugar . . . . .                                | 8.1                        | 13.9  | 17.1  | 20.9  |
| Kerosene * . . . . .                           | —                          | —     | 6.6   | 10.2  |
| Matches . . . . .                              | —                          | —     | 2.7   | 4.7   |

Producing about 300,000,000 roubles of annual Imperial revenue, the excise duties fall upon manufactured articles, whose total value hardly exceeds 400,000,000 roubles, or increase their total value by at least 75 per cent. Among them spirituous liquors, sugar, matches, and kerosene satisfy such popular needs as are much more important than those which are served by the great bulk of foreign goods upon which is levied a much lower duty than the excise. The amount of the former appears from the fact that the customs duties for 1890 equalled 142,000,000 roubles, while the value of the imported goods in that year is stated as 416,000,000 paper roubles. The custom duties thus formed 34 per cent of the value of the imported goods, which nearly equalled the value of the manufactured goods paying excise. Moreover, seeing that the extent to which such duties are imposed

\* Excise upon illuminating petroleum, oils and matches was introduced in 1887. There is no tax on salt in Russia.

in Russia not only does not exceed but even falls short of that which exists in the majority of transatlantic countries, seeing that in Russia articles of prime necessity support no indirect taxes whatever, (salt bears no excise, and grain no custom duties), finally seeing that high excise duties do not retard the development of the consumption of the corresponding products, and that the bulk of the excise especially on alcohol is paid by the working classes while foreign wares are, more or less required by all classes of the inhabitants interested in the development of home industry, articles of luxury being chiefly consumed by the upper classes, in which case customs duties to a certain extent equalise the burdens of imperial taxation, therefore the combined excise and customs duties form a perfectly rational basis for the financial resources of the Empire, and the noticeable contraction in the quantity of imported foreign goods (Table 1) must be ascribed to nothing else than to the development of home industry, particularly mining and manufacturing.

The heavy personal and land taxes which formerly existed are little by little being excluded from the budgets of the Russian Empire and gradually being replaced by taxes upon consumption. The objects of taxation are mainly, directly or indirectly, the manufactories, mills and trade. The imperial burdens are thus placed chiefly upon the industrial class of the population, instead of as formerly upon land and the agricultural class. This transfer forms one of the most important financial undertakings of modern internal life in Russia.

The numerical proof of such an assertion clearly follows from the comparison of the total values of the recorded home productions and foreign imports, quoted for the eleven years from 1880 to 1890.

TABLE 4.

| YEARS.               | Amount of home manufactures.<br>(Table 3) | Value of foreign imports *. | Total consumption of articles not of domestic manufacture. |
|----------------------|---|-----------------------------|--|
| Millions of roubles. |   |                             |  |
| 1880 . . . . .       | 1214                                      | 604                         | 1818   |
| 1881 . . . . .       | 1287                                      | 541                         | 1828   |
| 1882 . . . . .       | 1378                                      | 568                         | 1946   |
| 1883 . . . . .       | 1349                                      | 562                         | 1911   |
| 1884 . . . . .       | 1304                                      | 538                         | 1842   |
| 1885 . . . . .       | 1309                                      | 434                         | 1743   |
| 1886 . . . . .       | 1325                                      | 438                         | 1763   |
| 1887 . . . . .       | 1427                                      | 393                         | 1820   |
| 1888 . . . . .       | 1572                                      | 390                         | 1962   |
| 1889 . . . . .       | 1606                                      | 437                         | 2043   |
| 1890 . . . . .       | 1656                                      | 416                         | 2072   |

\* The figures here quoted refer to the values of goods examined in the customhouses.

In other words, the amount of home consumption in reference to goods of domestic production and obtained from abroad or from the home mining industries and from the larger home mills and manufactories, remains almost constant or grows only to a slight extent proportional to the increase of the population. A manifest increase appears only from the year 1887, but it is impossible, not to see an evident although slow growth of the home production at the expense of the foreign imports, which constitutes the prime object of a protective customs policy. The growth of the home manufacturing production, regulated by the Department of Trade and Manufactures is clearly to be seen in Table 3, from the amount of 841,000,000 roubles in 1880 and 1,064,000,000 roubles in 1890, for the whole Empire excepting Finland. From Table 4 it appears that the importation of foreign goods for the said years is equal to 604 and 416 million roubles. The amount for 1880 is 841 and 604 million roubles, or 1,445 million roubles; and for 1890, 1,064 and 416, or 1,480 million roubles. But as some of the chief articles of foreign importation consist of the productions of mills and manufactories, evidently the development of the home manufacturing industry of Russia is now taking place mainly at the expense of foreign productions. Such a growth, of course, only forms the first step in the development of the internal economical forces of the country, the crown of which is formed, on the one hand, by the growth of various requirements expressed in the amount of expenditure necessary for their satisfaction or in the growth of the buying capacity of the whole people, and on the other hand, by the growth of the export of the surplus of such goods upon which is expended the floating capital or its renewable energy, and not the fundamental capital of the country, as is the case in the export of grain, expending the fertility of the soil, or the export of coal the supplies of which cannot be renewed.

Thus England receiving cotton and wool and exporting goods made therefrom, Russia exporting flax, and the United States exporting cotton, expend not the forces of the soil of their respective lands but only the labour of their inhabitants and the work due to the solar heat of the countries. The carbohydrate principles of flax or cotton fibre do not contain soil elements determining fertility. But if Russia instead of flax, or the United States instead of cotton, exported fabrics prepared from them, evidently the productive forces of these countries would enjoy a higher degree of sufficiency than now. The present industrial policy of Russia is directed precisely to the end that the productive forces of the country should be turned to the manufacture of the abundant supplies of agricultural and mineral raw materials in the Empire, that the people may obtain new sources of wages and income and that the buying capacity and wealth of the country may be increased. The demand for articles not of domestic production is still small, but it is always better for the inhabitants when they are satisfied by such means as yield them new wages and permit them, even if only partially, to become accustomed to the satisfaction of their growing needs at the expense of increasing the development of the natural resources of the country. The growth of their production at the same time forms an increase in the world's supply, and this at last leads to a lowering of prices. With the present course of affairs, the home manufacturing industry is annually widening at the expense of foreign imports at the rate of about 40 million roubles, although the total demand for manufactured articles grows more slowly.

Remaining in the country this sum goes to enlarge the national wealth. Russia now consumes annually about two milliard roubles worth of goods of this kind, or reckoning about 120 million inhabitants, not more than 17 roubles a head. This comparatively small demand for products not of domestic or agricultural origin is determined not only by the predominance of the rural population striving to this day to satisfy all its needs through home productions, but also by the two considerations set forth below.

When with the abolition of the obligatory labour of the serfs in the sixties, the unsatisfactory character of the former patriarchal system of economy and the impossibility of its continuance became evident, and at the same time the necessity appeared for the development of industry, the conditions did not then exist for the birth and growth of a home manufacturing and mining activity. A demand for goods of this description began to be made by the country, but the satisfying of this demand was effected by means of foreign producers, the customs policy of that time being directed solely to the protection of existing kinds of industry and paying no attention to the establishment at home of the production of goods, the demand for which only became evident with the construction of railways. Thus, for example, notwithstanding the immense supplies of coal existing in Russia, foreign coal was admitted till 1884 duty free, while cast iron paid only an insignificant duty of 5 kopecks per pound at a time when the demand for it and for goods made from it, as iron and steel manufactures, grew to a great extent in consequence of the construction of railways. Thus during the twelve years only from 1869 to 1881 the annual imports into Russia were on an average as seen below.

|                    | IN THOUSANDS OF POUNDS PER YEAR. |            |            |
|--------------------|----------------------------------|------------|------------|
|                    | 1869—1872.                       | 1873—1876. | 1877—1880. |
| Cast iron. . . . . | 3,263                            | 4,129      | 9,319      |
| Iron and steel . . | 15,144                           | 20,768     | 18,124     |
| Machinery . . . .  | 3,620                            | 4,639      | 7,487      |

The total value of these imports for these twelve years only exceeded 1,100,000,000 roubles, and the payments for them formed one of the principal causes of the fall of the paper rouble. In the forties the value of the gold rouble was on a par with that of the paper rouble; in the fifties, 100 gold roubles equalled 101 to 110 paper; in the sixties, 105 to 132; during the period 1869—1872, from 118 to 130; in 1873—1876, from 119 to 151; in 1877—1880, from 154 to 159; in the eighties, from 180 to 181 paper roubles; in 1890 the ratio was, 100 gold varied from 125 to 147 paper.

At the same time the conditions always existed in Russia for the satisfaction of this demand by means of developing the home production. The demonstration of this fact is now to be seen in the greatly increasing production of cast iron, iron and steel goods, from the time when the principles of customs protection were ap-

plied to this industry. The demand for goods manufactured from cast iron has not diminished but has ever increased during recent years, while the satisfaction of this demand by home production began to grow only from the year 1883 when efficient measures were resorted to in order to enable the home production of cast iron, and iron and steel wares, to grow and compete with the earlier developed foreign production. In the sixties only about 20 million pouds of cast iron were obtained in Russia and the whole requirements of the country in cast iron, counting one poud of iron equal to one and a quarter pouds of cast iron and one poud of machinery equal to one and one-half pouds of cast iron, unavoidable losses taking place in the course of manufacture, reached 50 million pouds of cast iron. Russia's requirement remained about the same during the whole of the seventies when the home production was not able to satisfy more than 40 per cent of the existing demand. During the eighties the total requirement already exceeded 60 million pouds of cast iron per annum while the home production rose from 28 million to 56 millions, in other words, satisfied from half to two-thirds of the demand. During the current decade this branch of the industry has been growing still more, reaching in all, inclusive of cast iron, steel and iron, more than 70 million pouds. At the same time the home production is growing much faster than the increase in the demand, so that the import of foreign goods is falling greatly and the time is not far distant when the native production of iron, cast iron and steel will cover the demand and even surpass it. This will inevitably lead to a fall in prices and to a growth in the export which has long existed for Russian iron. In the same manner as in this branch of industry, a growth likewise began not long ago in many kinds of production, both mining and manufacturing, will correspond to the forces and requirements of Russia. Such a growth is taking place gradually and increasing the development of the home wages and wealth among the masses of the people.

The fate of the Russian petroleum industry serves as the best proof of the fact that the home mining and manufacturing forces of Russia are only awaiting an impulse to excite an increased growth. Customs protection here was granted in the sixties. According to the tariff of the year 1868, crude petroleum already paid 15 kopecks paper duty, while kerosene and machine oil paid 55 kopecks paper per poud. The petroleum industry being considered further on, in this volume, it will be sufficient here merely to point out that already in 1876, Russia imported a large amount of American petroleum products, in that year 2,666,666 pouds of illuminating oil alone. In the eighties not only the importation of foreign petroleum products ceased, but the export increased greatly, reaching already in 1890, 48 million pouds. Nor is this all, while the home consumption in 1876, with the excessively high prices of all articles of this kind, scarcely attained 4 million pouds, in 1890 the consumption within the country of illuminating oil alone rose to more than 30 million pouds, due to the rapid fall of prices. In Baku purified lighting oil now costs on the spot not more than 15 kopecks a poud. In view of this cheapness the Government has imposed an excise duty upon the home consumption of kerosene, which in 1890 yielded 10,500,000 roubles of revenue. A similar growth in the coal, iron, chemical and many other kinds of industries, made be expected as soon as the principles of a reasonable protection are applied to the productions of goods of these kinds. The development of the working of many of the natural resources of Russia

will lead not only to the lowering of their prices and the enlargement of their consumption, but also to the increase of wealth and prosperity, or as a consequence to the increase of the demand for goods not of domestic production. The example of the petroleum industry shows that several decades of years are required for the attainment of the proper growth of the Russian home manufacturing industry. The treatment on a large scale of petroleum in Baku was begun in 1862, while the almost complete suppression of foreign imports corresponds to the year 1882. The policy of a carefully thought out protection extended to various productions had scarcely begun in the middle of the eighties; the fruits, however, are already beginning to show themselves, although it is impossible to expect a complete result, especially the manifest enlargement of home consumption earlier than the beginning of the next century. The consequence of the prevalence of the conviction in the brilliant period of the sixties, when many sides of Russian life were being reformed, is that Russia as an exclusively agricultural country should not make any special efforts to develop its mining and manufacturing industries, being in a position to advantageously obtain in exchange for its grain all kinds of manufactured goods from foreigners. A result of such a view is not only the feeble development in Russia of mining and manufacturing industry, but the small buying power of the people, clearly expressed by the above figure of 17 paper roubles for each inhabitant. The industry which has been customary and from immemorial time peculiar to the Russian people, the growing of grain, has during the past twenty years suffered a great change throughout the whole world. This has had as a consequence the result of lowering the prices for grain produce during this period instead of advancing them. This phenomenon is generally known, but at the same time it may not be out of place to illustrate it objectively, making use for this purpose of the account of the Hamburg Exchange (Hamburg's Handel und Schiffahrt, 1888), where on Table 2, is shown the change in the prices of more than 300 articles from 1847 to 1888. For wheat the average price in marks per 100 kilos was as follows:

| 1847—50 | 1851—55 | 1856—60 | 1861—65 | 1866—70 | 1871—75 | 1876—80 | 1881—85 | 1886 | 1887 | 1888 |
|---------|---------|---------|---------|---------|---------|---------|---------|------|------|------|
| 19      | 23      | 23      | 20      | 23      | 24      | 22      | 19      | 15.1 | 15.0 | 14.4 |

Accordingly the average price for the fifties must be taken as 23 marks, for the sixties 21.50, for the seventies, again about 23, while it was about 15 at the end of the eighties. The fall from 23 to 15 marks shows a decline of 8 marks, while in reference to the prices prevailing at the end of the eighties this forms more than 50 per cent. Hence is evident the cause of the fact that the countries importing grain began in the eighties to protect their domestic production by import duties upon all forms of grain, as of the fact also that in countries exporting grain like Russia there appeared the deficits of the grain producers, leading to the making of every effort to diminish all general expenses upon grain, especially those arising from trade. The essence of the business is included in the following. The consumption of grain increases very slowly and proportionately to the growth of the

population, and depends in hardly any degree upon the decline of prices. The consumption of other goods on the contrary, for example, manufactured and mineral, grows incomparably faster. Thus the production of coal upon the whole of the earth's surface in 1850 was not more than 90 million tons; in 1890 it was more than 400 millions, i. e., in the course of 40 years the consumption of such articles increases with the fall in price. The production of grain required by industrial countries with the development of universal peace and trade relations, especially by sea, becomes most advantageous in subtropical countries, inhabited by peoples possessed of little energy and requiring to be supplied with the products of manufacture. Hence it follows that in the not distant future, countries like the United States and Russia, where the population is rapidly growing and industry developing, will cease the now existing export of grain and will direct their energies to the export of agricultural products only in the manufactured state.

The fall in the prices of grain products referred to above is due to two causes. In the first place, the number of countries supplying the western European markets, as England, Germany, France, Italy, Holland, and Belgium with grain, has lately increased, not only by the great rise in the imports from the United States but by supplies also from Austria, Roumania, India, Australia, South America and Africa. Such a result was due to the prevailing peace and to the cheapening of transport by sea. The increase of the supply of grain from countries not exhausted by agriculture, and especially from subtropical countries where labour is frequently recompensed by insignificant wages, brought about the result that the consumers producing manufactured articles lowered the prices on the grain they bought and were thus enabled to lower also the prices of the manufactures they supplied in return. The second cause of the lowering of the prices of corn upon the western European markets was the introduction by many countries, such as Germany, France, Italy and Greece, of customs duties upon foreign grain, with a view to protect the earnings of the home farmers. The Russian farmers, namely, the great bulk of the population, lost heavily from the fall in grain prices referred to. The cheapening of freights and a certain regulation of the conditions of the immense home and foreign grain trade of Russia mitigated the burden proceeding from the reduction in the prices of grain, but at the same time various symptoms began to show themselves of the impossibility of relying upon agriculture alone for the further development of the economical life of the country. Thus, for example, the improvement in the exchange of the paper rouble, so useful for all government and economical relations of Russia abroad, is obviously impeded by the circumstance that upon every improvement of the exchange, Russian farmers, that is, almost half Russia for the other half has to buy grain (Table 5) who are paid in paper roubles, have to bear losses dependent on the fall of the price of their production, already cheapened of late. For the solution of the problem confronting Russia, namely, how to improve the exchange and at the same time increase the wages and wealth of the whole population, there are two methods and their combinations suggested. These are first, to increase the price of the grain exported from Russia, and second, to enlarge the other earnings of its inhabitants. But the first method is not within the power of the people and does not satisfy all interests, because part of Russia are buyers and not sellers of grain (Table 5). At the same time the rise of prices of grain over the whole world must come of itself, in

the natural course of commerce; it is only necessary to wait. Therefore, there remains the second way, that is, the development in Russia of the industrial treatment of its other natural resources, under the conviction that it will lead not only to the increase of the national earnings, but to the export from Russia of various productions of its mining and manufacturing industry. With its cheap grain, with the existing preparation and the variety of the natural resources of the country this is possible for Russia more than for many other countries. This explains the increased protection during the present reign and the transitory economical condition from purely agricultural to industrial agricultural, in which the country now is.

The felling of many forests, the lack of moisture and the consequent repeated cases of crop failures are forcing the adoption of more thorough and rational methods of agriculture. But the absence of the development of manufacturing industry precisely in those governments of Russia which are the preeminent furnishers of grain, places a limit to efforts of this kind, as the cultivation of artificial grasses, roots and plants having a commercial importance cannot be widely developed unless the neighbourhood of industrial enterprises consumes them. Such kinds of agricultural products form the foundation of intensive systems of cultivation, already become necessary, in the majority of the localities of European Russia. Hence although the production of breadstuffs, mainly grain, in Russia has largely increased since the sixties, this has not led to an increase of the wealth in the agricultural districts of the Empire. Thus is explained the above indicated small demand for goods not of domestic production, and the feeble growth of the demand for such goods in late years.

Besides the transmigration to fresh lands, Siberia, the Caucasus or Russia's Central Asiatic possessions, now regulated and partly encouraged by Government measures, a happy issue from the situation is principally to be seen in the universal development of the mining and manufacturing industries throughout the whole of the Empire. Thus it will be made possible to extend the intensive system of agriculture and to increase its profitableness and thereby open new sources of wages to the people. The government has had recourse, therefore, to such a rational form of protection as should help to enhance the development of the working of the natural wealth of the country and of the treatment in manufactories and mills of every kind of raw material produced outside the country.

The turn taken by Russian economical life in this direction, coincides with the beginning of the eighties, that is, to the time of the beginning of the reign of the present Emperor, Alexander Alexandrovich, but receives the most evident expression in the new tariff of 1891. This began at first in very moderate dimensions to protect the raising of all kinds of minerals, for example, sulphur and pyrites, all sorts of ores, stones and coal. At the same time this tariff proceeded to encourage more highly than had the former the existing forms of industry employed in working up home raw materials, and to call new methods into being. This was particularly the case with the chemical manufacturing and metal industries and such rural occupations, as wine making, the making of all kinds of preserves, the preparation of artificial fertilizers, starch, products obtained from wood, such as turpentine, resin, cellulose, and of every kind of agricultural manufactured product. The fruits of this policy are already clearly apparent, and first of all in the direction taken by agri-



cultural activity. An obvious proof of this statement is the rapid growth of cotton planting in the warm regions of Russia, as explained in Volume I of this work and in Chapter I, of this volume.

A proof of the growth of the chemical industry in Russia, due to the application of protection, is to be seen in the establishment of the soda industry, the manufacture of bleaching powder, and in the increase of every kind of chemical works, taken place in the last few years. Among the fresh successes of manufacturing industry must be reckoned, above and beyond the increase in the total production, the growth in the export of cotton goods, now accompanied by return of the customs duties on cotton and dyes, the extension of silk growing, the establishment of silk-throwing machines, and the rapid increase in the production of vicuna and similar warm fabrics, containing wool and cotton.

The metallurgical movement shows not only a rapid growth in the production of iron, which has already put a stop to the importation of rails, but in the increase of production of all sorts of machines, the development of the getting of mercury, copper, lead and zinc in regions like that of the Donets, where formerly no industries of the kind existed, and where the abundance of coal especially favors it. The spread of phosphate mills, answering to the plentiful finds of beds of phosphate rock in many places will assist in increasing the abundance of the harvests, while the development of works for the construction of agricultural machinery, which has already begun, will facilitate and cheapen all kinds of agricultural labours. At the same time they will, like all development of manufactories and mills, furnish wages to the masses of the population and local buyers for the products of agriculture. All these and many other kinds of manufacturing activity in Russia are, however, now only passing through the initial period of their origin, and therefore still encounter many obstacles of various kinds. Thus, many forms of Russian industry should now be regarded as seeds sown at the right moment in an economical soil favourable for growth, demanding the blessed rain of government measures, now pouring down upon them, necessary for quick fruit, as appears from the case of the above mentioned rapid development of the Caucasian naphtha industry. It is necessary to bear this consideration always in view on making acquaintance with the descriptions set forth in this book of the various kinds of Russian manufacture.

Secured with an immense extent of fertile lands capable without extraordinary effort of feeding the people, even if increasing at the most rapid rate possible, possessing the climatic conditions necessary for the yielding of the most various productions of the vegetable and animal kingdoms, containing in her bowels, almost untouched, every possible kind of ore and stone beginning with the most abundant coal beds and ending with inexhaustible stores of scarcely touched native gold, finally as a territory, having in many parts already a dense population and situated midway between even more thickly populated regions of Europe and Asia, Russia as a country enjoying peace and order, determined by the absolute unity of the will and desires of the Emperor and of the whole people, aspiring with all the fire of youth to receive the blessings of enlightenment, has now reached the period at which the already existing germs of manufacturing industry must inevitably develop with tremendous pace.

But as a country of immense extent, Russia exhibits the greatest variety of

conditions for the growth of this kind of economical activity. This is especially true as the first conditions of such a development are density of population, (a scattered people not affording to manufacturing industry the fundamental conditions of a wide development, but only exceptional manufactories and mills), the convenience of ways of communication for the export of surplus products and the import of raw materials, and finally a supply of cheap fuel. But these three conditions are very unevenly distributed in Russia. Therefore, to become acquainted with Russia's industry it is necessary in the first place to enter into its divisions in districts possessing various economical characters. As however the administrative division of Russia into governments and territories, the number of which reaches, inclusive of Finland, ninety-eight, is very minute, it is convenient for the sake of clearness without departing from the administrative division according to which all statistical information is collected, to group all the governments into a few economical regions, whose number shall be limited. Following the most popular system of arrangement and beginning with the two capital industrial districts, a short description of these regions will be put before the reader.

## I. THE CENTRAL OR MOSCOW REGION.

This region often bears the name of the Industrial District, because many forms of manufacturing industry were first established there. Herein enter the governments of Moscow, Vladimir, Kaluga, Kostroma, Nizhni-Novgorod, Smolensk, Tver and Yaroslav. Their total may be classified as follows:

|  |    |
|--|----|
| Governments and territories in European Russia proper . . .                | 50 |
| »    »    »    » Finland . . . . .   | 8  |
| »    »    »    » Vistula Region . . . . .                                  | 10 |
| »    »    »    » Ciscaucasia and Transcaucasia                             | 12 |
| »    »    »    » Eastern and Western Siberia                               | 9  |
| »    »    »    » Steppe, Central Asiatic and<br>Transcaspian possessions . | 9  |
| Total . .  | 98 |

The above area covers about 356 thousand square versts, or about 7,360 square geographical miles, or more than the area of Great Britain but less than that of France. The number of inhabitants is about 12 millions. This most densely populated of the primitive Russian regions, although lying in the temperate zone and having long ago developed its agriculture, yet produces less grain than it consumes, and therefore became long ago a manufacturing centre. Here numerous household peasant industries are extremely well developed, and the people are imbued with an ancient trading and industrial spirit, so that the deficiency of agricultural activity is here compensated by the development of enterprise in a greater degree than in many other districts. The Moscovite Princes and Tsars had already planted here many kinds of industry, and this region is to be considered to this day as the most developed in an industrial sense. Here have been concentrated the most important manufactor-

ies of Russia, and many works engaged in the chemical, dye, glass, starch, starch and molasses, machine and founding industries; here are also the centres of all the most important internal, and the majority of the external, especially Asiatic, trading enterprises. The latter are concentrated in the commercial houses of Moscow and in the most important fair in Russia, that of Nizhni-Novgorod, commonly called *Makariiev*. Compared with the other parts of primitive Russia this district has the largest population.

Agriculture does not here yield great profits, both because of ancient cultivation and the exhaustion of the soil, and because the intensive method of raising grain, most appropriate here, is as yet little known. It is true, however, that here the growing of potatoes, the raising of artificial grasses, hop raising, and the cultivation of aniseed and other commercial plants, have been more developed than in the other parts of Russia. As a consequence of the state of agriculture the mills and manufactories of this district experience no lack of workmen of every kind, both skilled and unskilled. thus aiding to a considerable degree the rapid development of the industry of this district. The railways start from Moscow as from the natural centre and heart of Russia. All these conditions together with the character of its inhabitants make the region described at this day, as was the case in the sixteenth century, the most important district in respect to Russian economical life. Although mining industries are here little developed, the getting of iron, millstones, plaster of Paris, and many other minerals, had already begun in ancient times. These enterprises are, however, now being but slowly developed, although coal veins exist at a certain depth under the whole surface of the district. The coal, which is however not of high quality, crumbling easily and containing a large percentage of ash, is found along the southern edge of the region, in the governments of Tula, Biazan and Kaluga. This local fuel forms only a small part of that which is consumed in the region where wood is everywhere abundant.

In ancient times this region was covered with dense forests, and they are even at the present day abundant in the government of Kostroma, half of which is still covered with wood which is cut principally to supply the lower reaches of the Volga destitute of timber. In the remaining governments of the district the forests still occupy about one-third of the surface, and being more or less regularly renewed they serve not only for the building necessities of the inhabitants and for warming their dwellings, but also for supplying many manufactories, works, engines and steamers. The numerous manufactories and mills of this region, founded long ago and situated in the most populous parts, purchased forests enough to ensure their continued activity. This necessity largely increases the capital required for carrying on manufacture. The purchase of fuel is accordingly effected annually at the proper time, so that the wood may have time to get dry and to be then delivered by the winter sledge roads by the peasants who are then free from rural occupations. In consequence of the relative scarcity of forests the prices of wood fuel are rising considerably in the region; and in the localities most distant from ways of communication they reach, with delivery, not less than 10 to 15 roubles per cubic sagene, by weight about 240 pounds, or 4 tons. The customary cost to manufacturers of wood fuel is, however, already about 20 to 25 roubles per cubic sagene. As a cubic sagene of wood fuel is only equivalent for steam engines to 100 pounds of high quality coal,

at about 20 kopecks a poud, the latter can here easily supplant the use of wood. Good Russian coal is supplied to the Moscow region from the Donets basin, a distance of about eleven hundred versts, and partly from Poland. Coal from the Urals also may be sent thither by the Kama and Volga, while English coal may come from St. Petersburg. Formerly no small number of Moscow manufactories and mills were furnished with the latter, until Moscow was opened to Donets coal by the lowering of the railway rates.

Side by side with wood fuel and with coal from the above regions and from the neighbouring governments of Tula and Riazan, local peat and naphtha residues from Baku are now applied as fuel in large quantities in the Moscow district. The value of peat, in a dried and pressed state as fuel is not inferior to that of wood. As the owners of the works are able to supply themselves with it from the neighbouring localities, in case of an insufficiency of wood they prefer peat, the getting and carriage of which furnish winter wages to the surrounding population. But as peat yields little heat in proportion to its bulk, it does not pay to transport it very far. In this respect naphtha residues possess the excellent quality of containing in a small weight the greatest amount of heat, as 60 to 70 pounds of naphtha residues replace in a steam engine 100 pounds of the best coal, or about 250 pounds of wood, or as much as 300 pounds of dry peat. And as the price of a poud of residues in Baku is not more than 3 to 5 kopecks, and in the reservoirs of Nizhni-Novgorod, whither the residues are forwarded by the Caspian sea and the Volga, about 150 kopecks, they cost in Moscow in the railway cisterns about 21 to 23 kopecks per poud. At this price they compete easily with all other kinds of local and imported fuel in Moscow and vicinity, because the art of employing petroleum waste for all technical purposes, such as the stocking of steam engines, the welding and smelting of all kinds of metals, is already spread over the whole of Russia. At any rate for the industrial development of the Moscow region the question of cheap mineral fuel demands the greatest attention. Its dearness limits the growth at least of those industries which require much fuel.

It is not improbable that coal will be found in the deep strata of the Moscow region, because coal-bearing formations probably lie under the whole of the section, as was already indicated by Murchison. But however serious might become the importance of fuel for the Moscow region, however cheap it might be in some other districts of Russia, as in those of the Donets, the Ural or Poland, Moscow at any rate now concentrates so many enterprising people and forms such an advanced economical centre that it will long remain at the head of the extensive manufacturing development destined for Russia.

## II. THE BALTIC AND PETERSBURG REGION.

To this region must be reckoned the governments of Petersburg, Novgorod, Pskov, Courland, Livonia and Esthonia. The extent, namely, 277 thousand square versts, or about 5,717 square geographical miles, is only one-quarter less than that of the first region, but the number of inhabitants, about six millions, is but half as great, because of the scant fertility of the soil. From the earliest times Novgorod and

Pskov of old, and St. Petersburg, Riga, Reval and the present Baltic provinces have served as trade routes for communications with Western Europe. As a consequence the spirit of enterprise has long been here developed, leading to the establishment of many industrial undertakings, among which the manufacturing, chemical, metal and wood industries have acquired a most substantial position. But even now trade and agriculture, the latter developed here and there in more intensive forms than in any other parts of Russia, play in these regions an economic role incomparably greater than manufacture. This circumstance is explained by the presence of water ways of communication, alike connecting with the interior of the Empire, especially by the Neva and the systems uniting Lake Ladoga and the Volga and with Western Europe, St.-Petersburg as the capital and the key to these water ways, possesses many manufactories and mills of every kind, but the surrounding country contains but few of them, some parts of it, especially in the Novgorod government, are sparsely populated and filled with forest swamps.

In the Petersburg and Novgorod governments about 40 per cent of the surface is still covered with forests; in Esthonia and Livonia, about 25 per cent; in the remaining provinces, 30 per cent, so that there is here abundance of wood for fuel and the latter is about 70 per cent cheaper there than in the Moscow region. Nevertheless there is brought hither principally from England, for the purposes of the works, manufactories, steamers and steam engines, about 70,000,000 pounds or 1,200,000 tons of coal annually, at a cost on the spot of 16 to 17 kopecks per pound.

### III. THE FINLAND REGION.

The Grand Duchy forms a perfectly independent administrative region and is also separated from the other parts of the Empire in an economical respect, even possessing its own customs tariff. Its area, 328 thousand square versts, or 6,783 square geographical miles, is almost equal to that of the Moscow region, but the number of its inhabitants, about two and one-half millions, is 20 per cent thereof, sufficiently explaining the feeble development here of manufactories and mills. The principal industries of the country consist in agriculture, cattle raising, the felling and fashioning of timber, and the quarrying of stone. Cast iron and iron are obtained to the amount of about one million pounds, while numerous but small and various manufactories and works produce goods to the value of some 40 million roubles yearly.

The chief industries are spinning and weaving, wood, metals, butter and leather, paper, papier-mâché and pottery. The export of these goods into other parts of Russia reached 13 million roubles in 1890, while the import to Finland, principally grain, reaches 17 million roubles in the same year. Finland's foreign trade consists principally of timber and butter. The quantity of forest, some 42 per cent of the surface of the country, combined with the scanty population, makes it possible for Finland to develop her industry on a basis of wood fuel.

### IV. THE NORTHERN REGION OF EUROPEAN RUSSIA.

This comprises the governments of Olonets, Archangel and Vologda, limited on the north by the Arctic ocean, and bordered on the south by the Moscow and Baltic

regions; it is, over the greater part of its surface, not suited to the profitable cultivation of grain, and therefore, notwithstanding its immense extent, about 1,240,000 square versts, or 25,608 square geographical miles, is most thinly populated, counting but two million inhabitants. This region then, although it has an abundance of wood fuel, is very unproductive in respect to manufactories; but the country deals in timber and in the products of its dry distillation. It is occupied, moreover, in its southern parts with agriculture, grain and flax, cattle raising and also fisheries. Only in the Olonets government, where iron and copper ores have been known from ancient times, are metallurgical operations at all developed, and there feebly. In the course of time, in consequence of the convenient water communication with St. Petersburg, it may be possible to bring to life again this region inhabited by a people which retain to this day their ancient Russian customs and a completely patriarchal mode of life.

## V. THE EASTERN REGION OF EUROPEAN RUSSIA.

It borders on the Ural and the Volga and is composed of the governments of Viatka, Kazan, Ufa, Orenburg, Perm and Samara. This immense district which has been Russian territory only since the sixteenth century, but has become completely russified by emigrations begun already by the inhabitants of Novgorod in the most ancient times, contains 891,000 square versts, or 18,404 square geographical miles, and about 15 million inhabitants. The latter have settled here on account of the favourable local conditions. Part of this country consists of fertile black-lands passing in the south-east into steppes and in the north, into a forest region. On the east it borders on the ore-bearing Urals, on the west it is bounded by the Volga which opens, with the aid of the Kama and its tributaries, an easy communication to the whole region with the remaining parts of Russia. This eastern district is twice as scantily populated as the central region, but much more fertile than the latter and containing various kinds of mineral wealth, such as gold, salt, coal, iron and copper, and is acquiring an ever-increasing importance from an economical point of view, although in consequence of the felling of the forests which existed in the neighbourhood of the iron works of the Urals, the former importance of these works, as the furnisher of the most excellent iron for all Russia and for foreign export, especially in the form of very soft sheet iron, has considerably lessened in the last few decades. The cause of this fact must be sought, first of all, in the unsatisfactory condition of the forest economy upon those vast areas which are ascribed to the private and Government works of the Urals, and to the absence of such laws in reference to the right of using minerals which would secure the possibility of a sufficiently wide competition in the treatment of the ores of the given locality.

With the construction of the great Siberian Railway, with the increased working of the Ural coal mines, already long ago begun, and with the division of the ore-bearing estates into smaller parcels than at present, a rapid development may be again expected for the mining industry, the more so as there are here many persons well acquainted with its details. All the preceding districts import grain, but this produces an abundance of cereals in its southern and Chernoziom regions, so that in good years, namely those free from drought, it not only furnishes the less pro-

ductive north-eastern parts of the immense district with grain, but sends its cereals also up the Volga.

Taking into consideration the total amount of its mining and manufacturing industry the eastern district must be reckoned among the most important in Russia. The getting of gold, iron, copper and coal is concentrated in the eastern parts of the district, adjacent to the Urals. Many works are situated upon the Kama and its affluents, even to Kazan. Specially deserving of attention are the metal works, and those engaged in casting cannon and in the manufacture of arms, as well as those occupied in transforming pyrites and salt into various chemicals.

The southern part of the region, passing into steppe, is little wooded, in the Orenburg government only 15 per cent, in Samara only 8 per cent is covered with forest, and consequently suffers from a lack of fuel. The northern and eastern parts on the other hand are still rich in forest. Viatka has 61 per cent, Kazan 36, Perm 75, and Ufa 42 per cent of wooded surface. Add to this the supplies of coal in the Ural and the convenience of the water communication for obtaining naphtha waste from Baku and no difficulties are to be expected in obtaining fuel for the extensive development in this region of every kind of manufacturing industry. A beginning has been already made and the enterprising spirit of the Russian inhabitants of this district, forming as it does the bond between the Moscow or Central district and Siberia, is calculated to still further help it forward. This district should be regarded as the window giving industrial light to the Asiatic coast.

## VI. THE SIBERIAN REGION.

Siberia, or the northern part of Asia, stretches from the west to the east, from the Urals to the Pacific ocean, and from the Arctic on the north to the frontiers of Korea, China and the Kirghiz steppes, of the following seventh district, on the south. It comprises the governments of Tobolsk, Tomsk, Yenisseisk. (chief town Krasnoyarsk) and Irkutsk, the Territories of Amour, the Seacoast government, Yakutsk, Transbaikal and the island of Sakhalin. Its total area, about 11,000 thousand square versts, or 227,000 geographical miles, almost thrice exceeds European Russia without the Caucasian governments, and is much more extensive than the United States of America. Upon this vast territory there live only about five million souls, although the southern parts of the country abound in all the gifts of nature, beginning with a wealth of rivers, forests and fertile lands and ending with that abundance of mineral wealth which led to the saying: *Siberia is a golden well*. These parts of Siberia form a great reserve for the migration of the multiplying Russian people, even if half of the area of Siberia be completely excluded, a region occupied by bleak wastes, adjacent to the Arctic ocean. Unacquainted with wars and never having known the dependence of serfdom, Siberia was yet for a long time an object of terror from the rumours that circulated about it. But little by little prejudice is being removed.

With the completion of the Great Siberian Railway already begun, and with the abolition of the transportation of convicts, Siberia will not only serve by its extensive lands as a grower of grain, but by its mineral wealth will be the furnisher of metals, among which until now gold is obtained, it alone bearing a long transport by land to the exclusion of almost all other metals. The rich coal veins of the

Kusnetsk district and other parts of Siberia, together with its inexhaustible forests of cedars and other valuable trees mainly belonging to the fir family, give abundant security for the development of every possible kind of works and manufactories, steamers and railways.

At the present time the whole manufacturing industry of Siberia, apart from the extraction of gold, is confined to a few undertakings for the obtaining of goods such as iron, leather, glass, spirit, salt, cloth and vegetable oils, destined almost exclusively for local consumption and for a limited export to the Kirghiz steppes and to European Russia. Hither, too, are carried by way of Siberia tea and other Chinese wares, and thence by the water systems of the Volga and Kama, the Tobol and the Obi, return goods of the most various description, beginning with manufactures of many kinds, and ending with spices. The Ministry of Finance desiring to assist in the spread of trustworthy information about Siberia has undertaken the publication of a special description of this vast territory of the Empire for the World Columbian's Exposition.

## VII. THE CENTRAL ASIATIC REGION.

This region bordering on Siberia on the north-east, touching the southern parts of the governments of Tobolsk and Tomsk, on the north-west, the eastern portion of European Russia, namely Orenburg and Ufa, is bounded on the east by the government of Astrakhan and the Caspian Sea, on the south-west by Persia, on the south by Afghanistan and on the south-east by China, coming also into contact in the south with Khiva and Bokhara. This region includes the Kirghiz steppes and the comparatively recently annexed Central Asiatic dominions, possessing an Asiatic population among whom emigrants from purely Russian districts have latterly commenced colonising, thus forming in many places an unbroken Russian population. Among such localities must be reckoned beginning from the north and east, the territories of Semipalatinsk (chief town, Semipalatinsk), Semiretchinsk (chief town, Vierny), Akmolinsk (chief towns, Omsk and Akmolinsk), Turgaisk (chief town, Turgai), Uralsk (chief town, Uralsk), Samarkand, (chief town, Samarkand), Fergan (chief town, Margellan), Transcaspien, (chief town, Askhabad) and Syr-Daria (chief towns, Tashkend and Petro-Alexandrovsk). The area is about 3,080,000 square versts or 63,637 square geographical miles; the population, about six millions.

A considerable part of the inhabitants are nomads, Kirghiz and Turkmen, living still in a pastoral condition asking for almost nothing from manufacturing industry and providing it on their part only with wool, tallow, felt, and leather. But in the warm valleys of the southern parts of the region live tribes having fixed habitations, of the Bokharian type, actively occupied with agriculture and producing not only the grain and fruits of temperate countries, but also rice, cotton, every description of fruit, and together with the Russian settlers already representing a demand for many kinds of manufactures, and furnishing in their turn a mass of materials for manufacture, beginning with the products of ores and ending with cotton and wine. There can be no doubt but that the Russian dominion in these countries is tending to their rapid economical growth, and that the industry here springing up is developing very fast, being greatly assisted by the Transcaspien



Railway, whose construction from the Caspian Sea into the heart of the southern part of the Central Asiatic district was projected at first with purely strategical objects, to overcome the sandy deserts surrounding the highly favoured regions of the slopes of the vast Central Asiatic mountain ranges.

The average condition of the district must be called steppe and woodless, and therefore the lack of fuel is very much felt in the case of all industrial undertakings. However coal has already been found in some places, as also naphtha, while the comparative nearness of Baku with its abundant supply of liquid fuel and the easy delivery of the latter by sea and by the Transcaspian Railway help out even the pioneers. It is impossible not to point out that the fisheries, especially of the Ural territory, the naphtha springs found in various parts of the steppe, the richest deposits of native sulphur, cropping out almost on the very surface among the sands of the Kara-Kum, the most various ores discovered both in the Kirghiz steppes and in Turkestan, and the rapid development of ease and industry in the region, in some places so richly endowed by nature, furnish a guarantee that here is being formed a centre for the quick development in an economical sense of all the peoples of Central Asia, which again is greatly assisted by the friendly spirit and the tranquillity introduced with the annexation to Russia.

To show how rapidly the desired development is proceeding here it is sufficient to say that the chief town of the territory of Semiretchinsk, Vierny, situated  $43^{\circ} 16' N.$ , and  $79^{\circ} 59' E.$ , already counts twenty-two thousand inhabitants and is surrounded by many Russian settlements, although the whole of this Transilian region has been occupied by Russians only since 1853, and the first stones of the fortress were laid in 1854. At any rate the southern parts of the described territory, simply because they are capable of growing cotton, jute, indigo and similar products, present a great importance from the point of view of trade and industry, as these articles are now engaging the attention both of the local inhabitants and of Moscow industrial circles, with every assistance from the government.

## VIII. THE CAUCASUS.

This region reckoning all the possessions lying between the Black and Caspian seas, namely Transcaucasia, the Black sea district, the government of Stavropol and the territories of the Kuban cossacks on the west, and of those of the Terek on the east, occupies a surface of 415,000 square versts, or 8,580 square geographical miles, and has a population of about 8,000,000 inhabitants. With the cessation of hostilities in the Caucasus about 1865 the extremely rich region began to develop rapidly, not only in all other matters of civilisation but also in respect to the growth of manufacturing and mining enterprises. To confirm this statement it is sufficient to mention the development of the production in this region of petroleum, copper, coal, rock salt, Glauber's salt and sulphur. And as not only the obtaining of ores, especially of manganese, the usual grain growing and cattle raising, silk growing, wine making and the cultivation of all kinds of plants from hot countries, including among the latter the cotton plant, have already taken deep root in the region and as ores of lead and zinc have been discovered and even begun to be worked with increased efforts this district is capable of occupying an extremely prominent position in the

mining and manufacturing development of Russia. The chief obstacles to this at present are the incomplete limitation of private estates in many parts of the district, the scarcity of forests in many places and the lack of branch lines to the chief railways which traverse the country from the northern and southern slopes of the range of the Caucasus. And yet the further rapid development of the manufacturing activity of the Caucasus may be looked forward to in the near future, because its happy situation between two seas and the magnificent conditions of climate and soil of many parts of the region, as well as the measures being taken by the Government in aid of its economical development, are drawing to it the general attention of all Russia, more so than is the case with many other outlying regions of the Empire. At the same time the local population itself is displaying evident tendencies to a development of trade and industry, the more so as among this local population the Georgians, Armenians and Persians in Baku have an obvious bent to both these forms of activity.

## IX. THE SOUTHERN REGION OF EUROPEAN RUSSIA, ADJACENT TO THE CASPIAN, AZOV AND BLACK SEAS.

This region comprises the territory of the Don and the governments of Astrakhan, Ekaterinoslav, Tauris or the Crimea, Kherson and Bessarabia. The chief towns are Novocherkassk, Astrakhan, Ekaterinoslav, Simferopol, Kherson, Odessa and Kishiniov. In the most part these are fertile steppes, capable of a high agricultural cultivation. Only in the south of the Crimea are they traversed by the projection of a low mountain ridge, and in Bessarabia, by mountains of inconsiderable elevation, often regarded as the last spurs of the Carpathians. The only importance, however, is possessed by that granite bed which defines the rapids of the Dnieper and the outcrop of coal measures and every kind of ore in the region of the Donets. In the whole of this district, which a hundred years ago was still almost a desert, at the present day a population of ten million inhabitants must be reckoned, settled upon 566 thousand square versts, or 11,710 square geographical miles. Contiguity with the seas and the abundance of the steppes, watered by numerous rivers, beginning with the Volga, Don and Donets and ending with the Dnieper and Dniester, have always attracted thither emigrants from other parts of Russia and from other countries, led to the formation of Cossack and Colonist settlements and to the transference thither of whole villages from other parts of Russia, as occurred in the end of the last and the beginning of the present century. Hence it is that the greater part of this region often even to-day bears the name of Novorossia (New Russia).

Having become Russian, this country, especially the shores of the Azov and Black seas, attracted trade, and Rostov, Taganrog and Odessa became the centres of the foreign grain trade. The industrial development, which began here in the thirties, shows great promise, especially in connection with the rich and extensive coal measures of the Donets region. Rock salt, pyrites, the richest beds of iron ores, such as exist at Krivoi Rog, Korsak-Mogila and other places, as also ores of copper, zinc, mercury, silver, lead and manganese, the abundance of most excellent fire clays and various other kinds of minerals lying in the neighbourhood of the coal measures, define both

the contemporary mining and manufacturing importance of this region, and the extent of its further industrial importance in the future, which is particularly favoured by the fertility of the surface and the existence of numerous rivers, communicating with the centre of Russia and with the export harbours.

Wine making, silk growing and the raising of all kinds of fruits are here developed side by side with forestry, which is destined to moderate the extreme contrasts of climate in this southern steppe zone of Russia in which woods now constitute a great rarity. In a word, this is the region of the country which is destined to show, with the Caucasus, the greatest industrial future, especially in consequence of the nearness of the Black Sea.

## X. THE SOUTH-WESTERN REGION.

This region comprises the governments of Podolia, (chief town Kamenets-Podolsk), Volynia, (chief town, Zhitomir) and Kiev, (chief town, Kiev), and forms the natural transition from the previous district, in particular Bessarabia and Kherson and from the Austrian possessions of Galicia, on the one hand to Little Russia proper or the Thirteenth Region, through the marshy parts of the forest region of Volynia to the north-western districts of the Twelfth Region, and on the other hand to the Polish governments of Russia. It contains the oldest of Russian towns, Kiev, which was the first capital of ancient Russia. This region, with 145 thousand square versts, or 2,993 square geographical miles of surface, and more than 8 million inhabitants, and distinguished by the flourishing condition of its agriculture, has already begun its mining and manufacturing activity, expressed both in the exploitation of many minerals, such as brown coal or lignite, labrador, phosphate rocks, and iron ores, and by the development of beet sugar manufactories, with its comparatively dense population, may play its part in the coming development of Russia's industrial forces, to which however there are obstacles in the absence of an abundant supply of mineral fuel of its own and in the felling of the former extensive forests.

## XI. THE VISTULA OR POLISH REGION.

This region comprises the governments of the former kingdom of Poland, which passed to Russia, and with an area of 112,000 square versts, or 2,312 square geographical miles, has a population of about 9 million, being thus more thickly inhabited than any other part whatever of Russia. The chief branch of the economical activity of the inhabitants, as also of the whole Russian people, is agriculture and the industries related thereto, such as beet sugar manufacture and distilling. But as this region is rich in coal, as in the government of Petrokov, and has a denser population than that of the other parts of Russia, and in consequence of its proximity to the industrially developed parts of Western Europe, namely Prussia and Austria, it is more deeply imbued with the industrial spirit than the remaining districts of the Empire; and since Russia in the latter decades began to foster, with the help of a protective customs tariff the development of its internal industry, it has rapidly developed its mining and manufacturing activity. This movement was very strongly marked in the rapid growth of the getting of coal (See Mining Industry), and the production

of cast iron, iron, steel and zinc, and in the flourishing condition of the production of cotton and woollen fabrics. The productions of these and many other Polish manufactories and mills find a growing market throughout all Russia. By means of the competition of this industrial centre with the Moscow industrial region are attained, on the one hand, the fundamental object of Russia's protective policy, and on the other, that union of Poland with Russia which answers to the peaceful aims of the Russian people. But as the Polish coal is little adapted to the production of the coke required in metallurgical operations, which is easily obtained from the coal of the western Donets, and the mineral wealth of the region is limited, while the distance from the centres of sale especially from the east of Russia is great, it follows that to maintain her industrial growth Poland must constantly busy itself with the technical improvements of its manufacturing industries, which is indeed seen to be the case.

## XII. THE NORTH-WESTERN REGION.

This region contains White Russia and Lithuania, that is, comprises the governments of Vilno, Vitebsk, Grodno, Kovno, Minsk and Moghiliow, a part of which formed the ancient principality of Lithuania, which once struggled for independence with the Teutonic knights, and entered into alliance at one time with the Russian tsars, at another with the Polish kings, and was then united to the Empire. This forms in every respect the transition from the former to the two central and Baltic regions. The surface of this district, 269 thousand square versts, or 5,563 square geographical miles, is devoid of mountainous elevations, contains the vast marshy forest tract called Polesie, and is still rich in woods, which cover about one-third of its area. Its inhabitants, numbering about 9 millions, are almost exclusively occupied with agricultural pursuits, so that here, as in the following district, manufacturing is only in embryo, satisfying principally local needs which are being but little developed and gravitates in industrial respects to the Moscow, Baltic and Polish districts, as centres of manufacturing activity.

There is almost no mining industry whatever in the whole of this region.

## XIII. THE LITTLE RUSSIAN REGION.

This region contains thickly populated governments stretching from the west to the east and separating New Russia (Region IX) from the central grain producing governments (Region XIV). The Little Russians or Cossacks of olden times (Khokhly, *tufts*, as they are called by the common people), inhabit not only the governments of Chernigov, Poltava and Kharkov which form the region described, but also many localities in the neighbouring districts, especially in the South-western Region. In the seventeenth and eighteenth centuries it was here that was concentrated the activity of those primitive Russians, who once formed Russia's bulwork against the attacks of the Turks, principally by way of the Crimea, and against the Poles. Once a population of warriors to a man, the Little Russians have long become converted into veritable farmers, thanks to the fertility of the plain occupied by them. The surface of the district, 138 thousand square versts, or 2,846 square geographical miles, is fairly populated, there being between seven and eight million inhabitants, almost

indeed as much so as the South-western Region. Compared with the latter it is poor in minerals but richer than the two preceding regions in black-earth soil. On account of this and from the disposition of the inhabitants, and from the want of fuel of its own, forests here forming but ten per cent of the surface, manufacturing industry is here very slightly developed.

#### XIV. THE CENTRAL GRAIN OR CHERNOZIOM REGION.

This region occupies a vast area, 414 thousand square versts, or 8,560 square geographical miles, situated to the south and south-west of the Central Moscow Region, and to the north and east of Little Russia. Here the Chernoziom predominates, although not uninterruptedly over the whole district, and the fertility of its plains attracted hither from ancient times a mass of Russian folk who are agricultural in their former and in their present mode of life. In this district are to be included the gov-

T A B L E 5.

| REGIONS OF THE RUSSIAN EMPIRE.    | Sq. geog. miles. | Millions of inhabitants. | Inhabitants per sq. geog. mile. | Yield of grain and breadstuffs in millions of pouds. |             |                          | Annual production of spirit in millions of vedros, absolute alcohol. | Production of cast-iron in millions of pouds. |
|-----------------------------------|------------------|--------------------------|---------------------------------|--|-------------|--------------------------|--|---|
|                                   |                  |                          |                                 | Oats.  | Foodstuffs. | + surplus.<br>- deficit. |  |   |
| I. Moscow Central . . . . .       | 7,360            | 12                       | 1,630                           | 51   | 123         | - 27                     | 1.7  | 3.3   |
| II. Baltic-Petersburg . . . . .   | 5,720            | 6                        | 1,040                           | 26   | 59          | - 16                     | 4.7  | —   |
| III. Finland . . . . .            | 6,780            | 2.5                      | 370                             | 14   | 28          | - 3                      | 0.2  | 1.4   |
| IV. Northern . . . . .            | 25,610           | 2                        | 80                              | 7  | 16          | - 9                      | 0.2  | 0.1   |
| V. Eastern . . . . .              | 18,400           | 15                       | 820                             | 86   | 263         | + 76                     | 2.2  | 27.7  |
| VI. Siberia . . . . .             | 227,000          | 5                        | 22                              |  |             |                          | 1.1  | 0.4   |
| VII. Central Asiatic . . . . .    | 63,640           | 6                        | 94                              | Official information on harvests does not exist.     |             |                          | 0.1  | —   |
| VIII. Caucasus . . . . .          | 8,580            | 8                        | 930                             |  |             |                          | 0.9  | —   |
| IX. Southern . . . . .            | 11,710           | 10                       | 850                             | 15   | 227         | +102                     | 1.0  | 13.2  |
| X. South-western . . . . .        | 2,990            | 8                        | 2,670                           | 28   | 124         | + 24                     | 3.5  | 0.2   |
| XI. Polish . . . . .              | 2,310            | 9                        | 3,590                           | 30   | 107         | - 6                      | 3.2  | 7.8   |
| XII. North-western . . . . .      | 5,560            | 9                        | 1,620                           | 22   | 86          | - 27                     | 2.7  | —   |
| XIII. Little Russia . . . . .     | 2,850            | 7.5                      | 2,640                           | 17   | 109         | + 15                     | 2.2  | —   |
| XIV. Central Chernoziom . . . . . | 8,560            | 19                       | 2,220                           | 123  | 384         | +146                     | 8.3  | 2.5   |
|                                   | 397,070          | 119                      | 300                             | 359  | 1,526       | +275                     | 82   | 56.6  |

ernments of Tula, Oriol, Riazan, Kursk, Tambov, Penza, Saratov, Simbirsk, and Voronezh. The number of inhabitants of this district, about fifteen millions, making 46 to the square verst, is greater than in the Central Moscow Region, with 34 to the square verst, and forms the transition to the districts of Little Russia, 54 inhabitants to the square verst, and Poland., 80 to the square verst.

Agriculture alone has here already long become insufficient for the economical activity of the country, the more so as agriculture is here to this day carried on mainly on extensive farms, of such a pronounced character that in many places dressing with manure is only applied on hemp fields, while the lands, from ancient cultivation under grain, have already considerably exhausted their original fertility. For this reason migration into other districts with a more thinly settled population proceeds mainly from this and the Little Russian districts. But in contradistinction to the latter, there is here evident the beginning of various forms of manufacturing activity, assisted even now by the extensive forests of certain localities, for example, the governments of Oriol and Riazan. In general, however, this district is not

TABLE 5.

| Number of manufactories and mills not paying excise. | Annual production of manufactories and mills, in millions of paper roubles. |                    |         | Production of all manufactories and mills, being total of 8, 9, 10. |                      |   | Principal articles produced by the Region. | Development of export trade.  | Region. |
|--|---|--------------------|---------|---|----------------------|---|--|---|---------|
|  | Of those in column 7.   | Subject to excise. | Mining. | Total, million of roubles.  | Per inhabitant.      | Production of grain breadstuffs per inhabitant. |  |   |         |
| 3,750  | 417.2   | 29.8               | 13.1    | 460   | r. 38                | r. 10   | Manufactured, metallic and other goods.    | Considerable Internal and Asiatic. Considerable Internal and West European. | I       |
| 1,634  | 183.3   | 44.9               | 13.5    | 242   | 40                   | 10  |  |   | II      |
| 4,884  | 36.8  | 6.5                | 2.9     | 46  | 18                   | 12  | Wooden articles.                           | Feeble foreign  | III     |
| 198  | 6.2   | 0.7                | 0.2     | 7   | 3.5                  | 8   | Timber, flax.                              | Feeble.   | IV      |
| 1,901  | 53.0  | 10.0               | 51.5    | 114   | 8                    | 15  | Metals, grain.                             | Internal.   | V       |
| 684  | 7.5   | 3.3                | 37.0    | 48  | 10                   | —   | Gold, animal products.                     | Feeble.   | VI      |
| 388  | 12.8  | 0.5                | 0.8     | 14  | 2.3                  | —   | Cotton, animal products.                   | Feeble.   | VII     |
| 915  | 19.8  | 16.3               | 17.9    | 54  | 7                    | —   | Wine, naphtha, grain, copper.              | Internal and foreign.   | VIII    |
| 2,559  | 52.0  | 25.6               | 41.9    | 120   | 12                   | 19  | Coal, grain.                               |   | IX      |
| 1,002  | 21.1  | 36.9               | 0.2     | 58  | 7                    | 14  | Grain, sugar.                              | Feeble.   | X       |
| 2,354  | 155.6   | 33.8               | 20.9    | 210   | 23                   | 11  | Manufactures, metals goods.                | Internal.   | XI      |
| 1,214  | 23.8  | 15.6               | 0.0     | 39  | 4                    | 9   | Timber.                                    | Feeble.   | XII     |
| 767  | 19.1  | 30.4               | 0.2     | 50  | 7                    | 13  | Grain, sugar.                              | Internal grain.   | XIII    |
| 4,325  | 92.6  | 34.0               | 8.0     | 135   | 7                    | 19  | Grain, spirit.                             |   | XIV     |
| 26,595   | 1,100   | 289                | 208     | 1,597   | Average<br>13.5   14 |   |  |   |         |

thickly wooded, the proportion of forest varying from 9 to 23 per cent for different governments, while in some parts it is insignificantly small. Further, in the governments of Tula and Riazan coal measures have been found. From the earliest times the manufacture of various articles from iron and copper has been firmly established in Tula, such as, guns and samovars, used throughout Russia, and domestic implements.

In the Briansk forests of the Oriol government glass blowing, woodwork, the manufacture of machinery and other industries have sprung up, whose development in the so-called Maltsev district has acquired notoriety over all Russia. The distilling of alcohol, the beet sugar and many other branches of manufacturing industry here have all the necessary conditions for prosperity, and on the whole this district from its comparative populousness and central position, and from the discovery of local coal, must naturally by degrees pass over from a purely grain-growing activity to such a form of the combination of agriculture with manufactures as now already corresponds to the majority of the more densely inhabited districts of Russia, and which till now was to a certain extent observed by the Central Moscow Region alone.

The above enumerated regions of the Empire are entered in the annexed map which indicates the degree of development in them of manufacturing industries.

In order to still more closely characterize the industrial activity and mutual relation of the above indicated fourteen regions of the Russian Empire in the table given below, each Region has been shown in separate columns: 1. the area in square geographical miles (1 square geographical mile equals 48.38 square verstes, equals 55.06 square kilometres, equals 21.25 square English miles); 2. the number of inhabitants; 3. the density of the population, or the number of inhabitants to one square geographical mile; 4. the quantity of grain obtained per annum, distinguishing *a.* oats, as a grain grown throughout Russia principally as feed for horses; *b.* the total amount of breadstuffs going to feed the population: rye, wheat, barley, peas, maize, millet, buckwheat; *c.* the surplus or deficiency of the same; 5. the quantity of spirit distilled per annum, both from grain and from grapes, in vedros (1 vedro = 12,299 litres = 2.707 gallons) of absolute alcohol, which is a well known measure of the development in various regions of the manufacturing treatment of agricultural products; 6. the quantity in millions of pouds of cast iron, produced in the district in 1890, as a measure of the development in various districts of metallurgical works; 7. the number of manufactories and mills, excepting mining works and those which are subject to excise, registered in the reports of the Department of Trade and Manufactures; 8. the amount of the annual output of all the manufactories indicated in the preceding column, entered according to the declarations of the owners, in millions of roubles; 9. the amount of the output of the manufactories, subject to excise, distilleries, breweries, sugar bakeries, tobacco manufactories, petroleum refineries and match works, reckoning on an average without excise but with by-products, spirit at 2 roubles<sup>1</sup>, beer and mead at 1.50 roubles a vedro, sugar at 5 roubles a poud of refined,

---

<sup>1</sup> The values cited further on are expressed in paper roubles and represent the average fabric prices at the places of their production, including by-products not subject to excise. Thus, the price of spirit is about one rouble and a half, but as the malt grains produced

tobacco at an average of 30 roubles a pound for the higher qualities and 7 roubles for the lowest, or *makhorka*, and matches at 58 roubles a million, and 15 kopecks a pound for all illuminating and lubricating products of the distillation of petroleum (account is taken of raw naphtha in the amount of next column); 10. the amount of the output of the manufacturing and mining industries, under the purview of the Mining Department, reckoning a pound of gold direct from the mine at 20,000 roubles, a pound of silver, 1,100 roubles, copper 10 roubles, and zinc 4 roubles, cast iron, 50 kopecks, hardware made from same 1.50 roubles, iron and steel in rails, strips and sheets, at 1.50 to 2.25 roubles<sup>1</sup>, iron goods at 4 roubles a pound, coal at 6 kopecks, salt at 7 kopecks, naphtha at 5 kopecks a pound<sup>2</sup>, asphalt and *kir* at 15 kopecks a pound, sulphur at 1 rouble a pound, manganese ores at 40 kopecks a pound and phosphate rocks at 15 kopecks a pound; 11. the total of the amounts in the last three columns.

THE FOLLOWING REMARKS ARE IN EXPLANATION OF THE FACTS  
AND FIGURES CONTAINED IN THE TABLES.

In reference to the statistics of population it must be observed that as there has been no general census of the population in Russia since the fifties, the number of the inhabitants is only known approximately, being determined from the birth and death rates, and in general deduced from considerations which are subject to some question. On this ground there may be an error in the statistics of population reaching and even exceeding 5 per cent. Therefore, both in the case of the number of inhabitants, and the density of the population, as in column 3, only round numbers are used. These are founded upon the most trustworthy calculations, and include the population down to 1890.

Under the designation of breadstuffs are understood rye, wheat, millet, barley, peas, buckwheat, spelt and maize. The data for their yields, after deduction of seed were obtained in the Department of Agriculture from D. P. Semenov and constitute the average yield for the five years 1883 to 1887. The figures referring to oats are

thereby, together with the casks, cost not less than 50 kopecks, it is valued at 2 roubles per vedro. These values certainly vary according to the quality of the products, the years and the places of production, but the total value of the production is given here in order to show, although partly and conditionally, the relative development of the yield of excise products in different localities.

<sup>1</sup> Taking into consideration that not less than one and one-fifth pounds of cast iron are expended on a pound of steel and iron, and subtracting the value of cast iron, the production of iron and steel in strips, rails et cetera, must be reckoned at about 90 kopecks, and in sheets, at about 1.80 roubles.

<sup>2</sup> Although a pound of naphtha in Baku is at present estimated at not more than 2 kopecks, naphtha residues into which at present the principal mass of naphtha is transferred, cost about 3 to 6 kopecks; and as the account of the production of kerosene, among the products subject to excise, includes only lighting oils the value of the other products of naphtha distillation is estimated approximately, counting a pound of raw naphtha at 5 kopecks.



placed separately because this grain is almost exclusively used as feed for cattle. The calculation of the excess (+) or deficit (—) of breadstuffs has been made upon the basis of the hypothesis justified by many data that the yearly proportion of such breadstuffs per inhabitant of Russia may be assumed on an average as equal to 12.5 pouds, about 205 kilograms or about 451 English pounds, reckoning under this quantity also the various collateral applications of the same, which are, however, comparatively limited.

The number of manufactories and works given in the seventh column is taken from data supplied by the Department of Trade and Manufactures. In this calculation, in the case of all governments excepting Finland, no account is taken of printing and lithographing shops, nor of bakeries, wine making, nor of small household or artisans shops and works. Furthermore, from these figures are excluded distilleries, sugar bakeries and refineries, tobacco, kerosene and match manufactories and all mining works. Thus, the figures of this column designate only the statistics for the more considerable industrial undertakings, except mining and those subject to excise. A list by name of the majority of the manufactories is published in the form of a book by Mr. Orlov: «Index to the Manufactories and Mills», 1893.

The manufactories subject to excise are distilleries, manufactories of vodka, yeast, raw sugar, refined sugar, petroleum and kerosene, tobacco and matches. Their output is very accurately known, but only in terms of the quantity of their productions, not their value. For the sake of giving uniformity and summariness to the data, characterizing the industrial activity of the various parts of the Empire, this production should be translated into roubles, employing those average prices which are given in the text, where also are included, whenever possible, the value of collateral products. The excise dues are not included in the value of the products; they reached in 1890, 333,000,000 roubles.

Column 10 includes not only the getting of metals, as in Table 3, coal and salt, but also sulphur and naphtha, as shown in the notes explaining the tables. Although the comparative magnitude of the amounts, given in columns 11 and 12, shows the degree of development of industry in different parts of Russia, these figures do not exhaust the whole mining and manufacturing production of the country, not only because not all the manufactories and works are subject to effective registration as was observed above, but also because the valuation of the production in each case itself suffers from various defects. A near idea of the magnitude of the industrial development, with the exception of mining works and manufactures paying excise, which are here given with all possible accuracy, is to be obtained from the figures of the eighteenth column of the next table, because they are determined according to declarations verified by the local courts of taxation with the participation of the producers themselves. The data for Finland are borrowed from the official publication, *Statistisk Årsbok för Finland 1889 and 1890*, but the information upon industry for this district refers to 1886 to 1888. The statistics of the harvest belong to 1887, which was particularly plentiful in Finland. Hence depends the circumstance that the deficiency of grain in Finland (3 million pouds) appears below the ordinary import of that article into the country, namely, about 5 to 6 million pouds. It is known that the north and south of the Caucasus and the western part of Siberia export grain, while the Central Asiatic Region is satisfied with its own

grain, a part even being exported. Hence the total surplus of breadstuffs in Russia in years with average harvests is more than that which is given in the total of the fourth column of the table. The harvest for the Polish region is taken as the average of the combined information for 1889 to 1891, obtained together with other data as indicated above. The average harvest of oats being 359 million pouds, Russia sends abroad on an average about 56 million pouds, which shews a consumption of about three pouds per inhabitant. Oats in Russia are mainly used as feed for horses.

The average surplus of 275 million pouds of breadstuffs obtained in years of average yield, such as were the years 1883 to 1887, corresponds to the average export across the European frontier, not counting the Caucasus, which is given by the customs accounts for 1884 to 1888, by which the relative justice of the method of calculation here adopted is proved. At any rate it is indisputable that the regions I, II, III, IV and XII do not produce a sufficient quantity of grain, while the regions V (the Eastern), IX (the Southern) and XIV (the Middle Chernoziom) in general furnish with their surpluses not only the other regions of Russia, but also many regions of Western Europe, especially Germany and Great Britain. Although the regions I, II and XI show a development of industry combined with a deficit of grain, and therein resemble the countries of Western Europe, yet the Eastern (V) and Southern (IX) regions present a simultaneous development both of the grain industrial production, of which many other regions of Russia are capable, and especially the Caucasus.

The total amount of the manufacturing production of Russia in 1890 given in the table, 1,597 million roubles, differs from that given on page VII, 1,656 million roubles, principally in this, that in the case of industries subject to excise, sugar, tobacco, beer, spirit and matches, the values are quoted with excise duties. This was done because it was impossible for the preceding years to completely separate the excise upon these articles, to judge from official data, while for 1890 it was possible. In the case again of the products of the naphtha industry, average values taken over several years were quoted, while for the account of the year 1890 the average prices of that year were taken, which are lower than those in the preceding years; at any rate from the difference in the figures upon which they are based the possibility of a greater error must be admitted. As a consequence the figures given in the table must be regarded as only approximate and intended to give an idea of the economic activity of different regions of Russia. Thus, for example, in the table it is clear, that the value of the produce of grain in the Central Region (I) is several times less than that of the products of manufacturing industry, the same appearing to be the case for the regions II and XI, while in the case of the Little Russian and Central Chernoziom regions (XIII and XIV) the reverse holds good. The value of the grain is higher than the value of the products of the manufacturing factories and mills. To this last category belongs the majority of the remaining regions, even the Eastern and the Southern.

By the figures of the last column an effort is made to express the value of the breadstuffs produced in the Region per capita, assuming by a convention the value of a poud of oats at 50 kopecks and the average value of a poud of breadstuffs as 80 kopecks. It thus appears that only in the Central Chernoziom Region and in the

Southern do they amount to 19 roubles per capita, while the average yield of grain to each inhabitant of Russia reaches 14 roubles a year, nearly equalling the value of the production of the manufactories and mills, although in different regions the differences are very sensible. The greatest industrial development, however, combined with export of grain is attained above all in the Eastern and Southern regions, supplying grain and metals to the other regions of Russia, and so proving that the desired combination of agricultural with manufacturing and mining activity is both natural and possible. The highest amount of production falling per inhabitant is however to be clearly found in the two metropolitan regions (I and II) and the Polish (XI) where manufacturing, and not grain growing industries, predominates.

In the above mentioned reports of various Government organs there are no data upon many important industries, for example, wines, wood charcoal, tar obtained by the peasants in the woods, carts, harness, bricks and a number of household products. Moreover, generally speaking, the collection of statistical data, touching various branches of industry, with the exception of those which are subject to excise dues, is not yet carried out systematically. For these reasons the figures set forth in columns, 7, 8 and 11, must be regarded as merely approximate and relative in value. Their relative magnitude, however, nevertheless characterizes the degree of industrial development of the various districts of Russia. In completion of this characterization, columns 12 and 13 exhibit in roubles per inhabitant the quantity of production both of manufactured goods (Column 12) and of cereals (Column 13), these figures showing clearly the relative degree of development in the Region concerned of the two classes of industries, manufacturing and agricultural. For the further explanation of the character of the regions of Russia, the Tables on pages XXVIII and XXIX also is inserted, taken from the report recently published by the Department of Trade and Manufactures, under the title, «Statistical Results of the Rates and assessed Taxes for the Year 1889». In 1889 both guild and non-guild, commercial and industrial undertakings, were all subject to assessment. All the more extensive commercial undertakings pay guild dues, while some industrial enterprises are exempt. Among the various forms of business were included, 1,184 companies with shares, not counting railways and mutual insurance, 142,981 guild concerns, among which were purely commercial, contracts, hotels, warehouses and carriers, besides manufactures, printing offices, photographic shops, tailor and bookmaker shops and other trades and industries. There were further 250,624 non-guild forms of business, in all 394,789 concerns, or including those exempt from assessed taxes and rates, 420,000 undertakings.

It must here be observed that Finland knows no assessed taxes and that rates are collected throughout the Empire, again excepting Finland, from industries and all kinds of undertakings with shares. Assessed taxes are not exacted in the Central Asiatic district, while in the Transcaucasian governments, in Siberia and in the governments of Tobolsk, Tomsk, Yeniseisk and Irkutsk, they are collected only from undertakings, the remaining or non-guild being exempt therefrom. Finally, in the governments of Olonets and Archangel assessed taxes are only exacted from guild enterprises. Among the undertakings paying assessed taxes but not paying guild dues, namely such as are small and personal, are both commercial and industrial or manufacturing undertakings. For the purpose of this work, there is no need to distinguish payers of guild dues from others. It is more important to draw the dis-

inction among these two classes between the commercial and industrial undertakings which are registered during the collection of the assessed taxes and rates. This is done in Table 6 annexed, where the amount of the annual output and profits arising from them is given in millions of roubles. As in Finland and in the Central Asiatic Region the taxes under consideration are not collected, and there exists no corresponding information, these districts have been omitted from the table, which, judging from what has been said above, neither gives complete information upon the Northern nor the Siberia regions. For the remaining regions the data given must be regarded as the most complete of all as yet collected. At the same time it must be observed that the total amount of the assessed taxes received by the treasury from commercial and industrial undertakings in 1889, reached 5,078,068 roubles, upon a calculated total revenue from the undertakings taxed of 280 million roubles, this tax thus forming but 1.8 per cent of the revenue. There is, therefore, no reason to suppose that in the calculation of the operations and revenues of undertakings any great error has crept in, the more so as they were determined by the local offices for tax collection assisted by selected tax payers. The supposition is, however, more likely that the reality exceeds the estimate.

The relative significance of the statistics for various district must be assumed to be worthy of credence, and therefore should form a concrete measure of the trading and industrial development and importance of the separate districts of Russia. As far, however, as concerns the data upon the three per cent tax payable from the revenues of share undertakings, they are drawn straight from actual reports and are not subject to question on the score of their accuracy, although the extent of the annual operations is not given, but merely the amount of profits. But as on the calculation of the assessed rates from guild or large private non-share trading concerns (Table 6, columns 6 and 7) it is proved that they have an annual turnover of forty roubles for every rouble of profits; in the same way, in the case of commercial share undertakings it has been assumed that one rouble of profits corresponds to fifty roubles of annual turnover, as share operations do not yield as great profits as private concerns. In like manner, from the fact that in industrial guild undertakings there are about 15 roubles of turnover to one rouble of profits (Columns 9 and 10), one must conclude that in the case of industrial share undertakings about 20 roubles worth of business corresponds annually to each rouble of profits, (Column 4). From these hypotheses it is clear that an arbitrary element in the calculations creeps in, and therefore the data taken direct from the official report exhibited in the first sixteen columns should be sharply separated from the conditional deductions drawn by the writer of this Introduction and placed in the last columns. In this way the annexed table № 6, has the following contents: first, from the data upon the rates, that is, upon share undertakings; 1. the number of commercial undertakings; 2. their profits; 3. the number of industrial or manufacturing undertakings; 4. their profits; second, from data upon guild, non-share undertakings; 5. the number of commercial undertakings; 6. their annual turnover; 7. their annual profit; 8. the number of industrial undertakings; 9. their annual turnover; 10. their profit; third, from the data upon non-guild or smaller, but not the smallest, private undertakings not liable to assessment; 11. the number of commercial undertakings paying tax; 12. their turnover; 13. their profit; 14. the number of industrial

undertakings of the same category; 15. their turnover; 16. their profit; in the following columns are given the conclusions, namely: 17. the sum of the annual turnovers of the commercial undertakings, that is, the 2<sup>nd</sup> column multiplied by 20 + that of the 6<sup>th</sup> column + that of the 12<sup>th</sup> column; 18. the sum of the annual turnovers of the industrial undertakings, that is, the sum of the figures of the 4<sup>th</sup> column multiplied by 20 + that of the 9<sup>th</sup> column + that of the 15<sup>th</sup> column; 19. the sum of all the turnovers of the undertakings subject to rates and assessed taxes, that is,

TABLE 6.

| UNDERTAKINGS ASSESSED WITH A SPECIAL ADDITIONAL TRADE PERCENTAGE AND DISTRIBUTARY TAX, 1889. | SHARE.                  |         |             |         | LARGE (GUILD, PRIVATE). |           |         |             |           |         |
|--|-------------------------|---------|-------------|---------|-------------------------|-----------|---------|-------------|-----------|---------|
|  | Commercial.             |         | Industrial. |         | Commercial.             |           |         | Industrial. |           |         |
|  | Number.                 | Profit. | Number.     | Profit. | Number.                 | Turnover. | Profit. | Number.     | Turnover. | Profit. |
|  | Profits and turnover in |         |             |         |                         |           |         |             |           |         |
|  | 1.                      | 2.      | 3.          | 4.      | 5.                      | 6.        | 7.      | 8.          | 9.        | 10.     |
| I. Moscow government . . . . .   | 50                      | 8.7     | 159         | 22.7    | 8978                    | 1560      | 23      | 1996        | 138       | 8       |
| > Central district . . . . .   | 93                      | 0.7     | 27          | 2.9     | 11889                   | 167       | 11      | 1381        | 88        | 6       |
| II. Petersburg government . . . . .  | 96                      | 18.0    | 87          | 12.3    | 8759                    | 2081      | 26      | 1037        | 68        | 4       |
| > Baltic region . . . . .  | 82                      | 1.7     | 17          | 1.3     | 7501                    | 373       | 11      | 792         | 35        | 2       |
| IV. Northern region . . . . .  | 7                       | 0.1     | —           | —       | 2477                    | 31        | 2       | 157         | 6         | 0.      |
| V. Eastern region . . . . .  | 82                      | 0.8     | 5           | 0.2     | 15421                   | 222       | 15      | 977         | 20        | 1.      |
| VI. Siberia (part only assessed). . . . .  | 25                      | 0.1     | —           | —       | 4832                    | 61        | 5       | 229         | 5         | 0.      |
| VIII. Northern Caucasus . . . . .  | 16                      | 0.1     | 6           | 0.5     | 6617                    | 96        | 7       | 176         | 3         | 0.      |
| IX. Southern region . . . . .  | 77                      | 3.8     | 19          | 0.9     | 16439                   | 1342      | 37      | 1104        | 46        | 5       |
| X. South western region . . . . .  | 17                      | 1.7     | 51          | 4.4     | 6791                    | 101       | 6       | 824         | 18        | 2       |
| XI. Polish region . . . . .  | 24                      | 1.9     | 58          | 6.5     | 6530                    | 348       | 9       | 1410        | 88        | 5       |
| XII. North-western region . . . . .  | 40                      | 1.1     | —           | —       | 6098                    | 94        | 5       | 613         | 13        | 1       |
| XIII. Little Russian region . . . . .  | 41                      | 2.2     | 10          | 0.4     | 8314                    | 156       | 10      | 692         | 20        | 2       |
| XIV. Central Chernoziom region . . . . .   | 90                      | 0.8     | 4           | 0.2     | 18765                   | 196       | 11      | 2182        | 53        | 4       |
|  | 740                     | 42      | 443         | 52      | 129411                  | 6828      | 178     | 13570       | 601       | 41      |

the sum of the figures of the 17<sup>th</sup> and 18<sup>th</sup> columns. The data for the metropolitan governments, Moscow and Petersburg, are separated in this table in distinct lines.

The figures of the 18<sup>th</sup> column exceed those representing the production of the mills and manufactories, which is given for 1889 upon page VII, (with the excep-

tion of those subject to excise and those placed under the control of the Mining Department), principally because here are included such industrial establishments as workshops and rather small trades, tailoring, bookmaking, bakeries, bookbinding and sign-painting, workmen's cooperative societies (artels), flour mills and such like, which do not enter into the number of manufactories and works reckoned in the totals quoted in the 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> tables.

TABLE 6.

| SMALLER NON-GUILD PRIVATE. |           |         |                         |           |         | MILLIONS OF PAPER ROUBLES. |                            |   | Turnover in roubles per inhabitant. | №. of district or region. |
|----------------------------|-----------|---------|-------------------------|-----------|---------|----------------------------|----------------------------|---|-------------------------------------|---------------------------|
| Commercial.                |           |         | Industrial.             |           |         | Total commercial turnover. | Total industrial turnover. | Total commercial and industrial turnover. |                                     |                           |
| Number of undertakings.    | Turnover. | Profit. | Number of undertakings. | Turnover. | Profit. | 50 (2)<br>+ (6)<br>+ (12)  | 20 (4)<br>+ (9)<br>+ (15)  | (17)<br>+<br>(18)                         |                                     |                           |
| Billions of paper roubles. |           |         |                         |           |         |                            |                            |   |                                     |                           |
| 11.                        | 12.       | 13.     | 14.                     | 15.       | 16.     | 17.                        | 18.                        | 19.                                       | 20.                                 |                           |
| 8,560                      | 42        | 4.7     | 3,700                   | 24        | 2.6     | 2,281                      | 770                        | 3,051                                     | 254                                 | I                         |
| 20,949                     | 42        | 3.5     | 2,190                   | 8         | 0.6     |                            |                            |   |                                     |                           |
| 8,225                      | 56        | 4.0     | 2,514                   | 16        | 1.5     | 3,521                      | 397                        | 3,918                                     | 653                                 | II                        |
| 12,704                     | 26        | 3.2     | 1,298                   | 6         | 0.9     |                            |                            |   |                                     |                           |
| 2,628                      | 3         | 0.2     | 55                      | 0.1       | 0.0     | 39                         | 6                          | 45  | 23                                  | IV                        |
| 25,897                     | 51        | 4.2     | 1,537                   | 6         | 0.5     | 313                        | 30                         | 343                                       | 23                                  | V                         |
| —                          | —         | —       | —                       | —         | —       | 66                         | 5                          | 71  | —                                   | VI                        |
| 4,345                      | 8         | 1.2     | 250                     | 1         | 0.2     | 109                        | 14                         | 123                                       | —                                   | VIII                      |
| 22,511                     | 67        | 8.6     | 1,458                   | 9         | 1.3     | 1,599                      | 73                         | 1,672                                     | 167                                 | IX                        |
| 24,067                     | 46        | 5.3     | 1,260                   | 4         | 0.5     | 232                        | 110                        | 342                                       | 43                                  | X                         |
| 31,537                     | 69        | 6.9     | 2,035                   | 8         | 0.9     | 512                        | 226                        | 738                                       | 82                                  | XI                        |
| 20,800                     | 36        | 3.9     | 835                     | 3         | 0.8     | 185                        | 16                         | 201                                       | 22                                  | XII                       |
| 13,191                     | 20        | 2.0     | 715                     | 3         | 0.3     | 286                        | 31                         | 317                                       | 42                                  | XIII                      |
| 35,126                     | 50        | 4.0     | 2,237                   | 6         | 0.5     | 286                        | 63                         | 349                                       | 18                                  | XIV                       |
| 230,540                    | 516       | 52      | 20,084                  | 94        | 10      | 9,455                      | 1,741                      | 11,196                                    |                                     |                           |

In reference to the Northern Region (IV) it must be observed that the Olo-nets and Archangel governments do not pay distributary taxes upon non-guild undertakings. In Siberia such dues are introduced only in parts of the country, and there only upon guild operations. Transcaucasia and Central Asia also do not bear distrib-

utary taxes while in Finland there exists the income tax of a totally different character. For this reason the total amount of the operations for the whole Empire is higher than that given in the 19<sup>th</sup> column of the table. For the comparison, however, of the commercial and industrial activity of the majority of regions in Russia the data set forth are sufficiently reliable.

A few mining share industries and some excise industries enter into the number of industrial undertakings paying percentage taxes (Column 2) while among industrial undertakings paying distributary taxes are included printing offices, photographic studios, bakeries and other similar forms of business, not registered in Russia among manufacturing industries. In consequence thereof this figure is higher than that cited above. Another cause of the discrepancy in the figures is due to the fact that the turnover of the share undertakings (Column 4) was found from the profits by multiplying by twenty, a process which has only a conditional force for the comparison of the turnovers for different regions of Russia.

The considerable magnitude of the total business, per inhabitant in the Balto-Petersburg region is evidenced not only by the fact that certain branches of administrative, industrial and commercial activity are concentrated in St. Petersburg, but also by the fact that here are centered many commercial and industrial enterprises, such as banks and insurance companies, which operate over the whole of Russia. From the figures quoted above it appears that commercial and industrial operations taken together are most active in the Moscow, Petersburg, Polish, Southern and Eastern regions of Russia. If the commercial operations of the Petersburg Region prove the greatest, it depends upon the concentration there of the chief capital of extensive monetary operations of many banks, insurance companies, stock companies in general and sea trade.

The considerable amount of the commercial operations of the Moscow Region depends not only upon concentration for many years of large commercial concerns furnishing the majority of the provinces with all kinds of merchandise, such as manufactures, tea, sugar and other necessities, but upon the fact that manufacturing industry is here more highly developed than in any of the other regions. Next follows, in respect to the sum total of their commercial operations, the Southern Region, the cause of which must be sought for in the neighbourhood of the Black Sea, whose ports carry on an immense home and foreign trade, manufacturing began here only thirty years ago, but promises a rapid growth, thanks to the scarcely touched wealth of the Donets basin whose coal has already begun to attract to itself the iron and chemical industries. In the Polish Region, although the works and manufacturing are, on account of the density of the population, much more considerably developed than in the Southern Region, nevertheless commercial operations are only one-third of those in south Russia. This difference in the two regions in question (IX and XI) is the more remarkable that their populations are almost equal, although the area of the Polish Region is scarcely one-fifth of that of the Southern. The chief cause of the difference must be sought in the fact that the Black Sea and the Sea of Azov give life to the whole foreign trade of Russia, especially in reference to the export of grain.

The following statistics show the importance of the Black Sea ports and of grain freightage in the Russian export trade:

TABLE 7.

|                | ALL GOODS OVER ALL FRONTIERS. |         |        | EXPORT BY SEA OF GOODS.          |                  |               |
|----------------|-------------------------------|---------|--------|----------------------------------|------------------|---------------|
|                | Import of foreign goods.      | Export. | Total. | By seas of Southern Re-<br>gion. | Caucasian ports. | Baltic ports. |
|                | In millions of roubles.       |         |        |                                  |                  |               |
| 1883 . . . . . | 562                           | 640     | 1,202  | 184                              | 8                | 247           |
| 1884 . . . . . | 538                           | 589     | 1,127  | 177                              | 15               | 217           |
| 1885 . . . . . | 434                           | 539     | 973    | 195                              | 14               | 159           |
| 1886 . . . . . | 438                           | 488     | 926    | 172                              | 23               | 144           |
| 1887 . . . . . | 393                           | 623     | 1,016  | 281                              | 24               | 175           |
| 1888 . . . . . | 391                           | 794     | 1,185  | 342                              | 31               | 200           |
| 1889 . . . . . | 437                           | 766     | 1,203  | 304                              | 48               | 194           |
| 1890 . . . . . | 416                           | 704     | 1,120  | 260                              | 60               | 179 *         |

TABLE 8.

|                | Export of all goods.  |                           | I.  | II.   |     | III.  |
|----------------|-----------------------|---------------------------|---|---|-----|---|
|                | Across all frontiers. | Across European frontier. | Export of all except breadstuffs across Euro-<br>pean frontier. | Export of bread-<br>stuffs across Euro-<br>pean frontier. |     | Average price for five years per pound of breadstuffs exported. |
|                | Millions of roubles.  |                           |   | Millions Pounds.   Roubles.                               |     |   |
| 1876 . . . . . | 401                   | 379                       | 176   | 221   | 203 | 102.5 kop.  |
| 1877 . . . . . | 528                   | 508                       | 244   | 260   | 264 |   |
| 1878 . . . . . | 618                   | 597                       | 231   | 371   | 366 |   |
| 1879 . . . . . | 628                   | 606                       | 243   | 348   | 363 |   |
| 1880 . . . . . | 499                   | 476                       | 248   | 198   | 228 |   |
| 1881 . . . . . | 506                   | 481                       | 240   | 202   | 241 | 102 kop.  |
| 1882 . . . . . | 618                   | 590                       | 269   | 293   | 321 |   |
| 1883 . . . . . | 640                   | 608                       | 258   | 336   | 350 |   |
| 1884 . . . . . | 590                   | 551                       | 241   | 308   | 310 |   |
| 1885 . . . . . | 539                   | 498                       | 218   | 331   | 280 |   |
| 1886 . . . . . | 488                   | 437                       | 220   | 261   | 217 | 81.5 kop.   |
| 1887 . . . . . | 623                   | 569                       | 261   | 377   | 308 |   |
| 1888 . . . . . | 794                   | 728                       | 301   | 522   | 427 |   |
| 1889 . . . . . | 766                   | 687                       | 335   | 438   | 352 |   |
| 1890 . . . . . | 704                   | 610                       | 301   | 380   | 309 |   |

\* About 70 per cent by value of all the foreign trade of Russia is by sea. Such is the importance of the seacoast for the country.



I. In Table 10, are shown what kinds of goods other than grain are exported by Russia and in what quantities.

II. Wheat, rye, barley, oats, buckwheat, millet, maize, peas, beans, meal, spelt, flower and bran.

III. The figures of this column show that from the year 1885 the prices of breadstuffs, under the influence of the duties in many countries of Europe and under the influence of other causes, began to fall perceptibly. A part of the change in the average price of exported breadstuffs depends upon the fact that in the course of time the demand for cheaper rye began to increase, in place of the former export, almost exclusively restricted to wheat.

The great commercial importance of the Moscow, Petersburg, and Southern regions comes prominently into view even on considering the number of trade documents, certificates, tickets and licenses to trade, issued in the various districts, as seen in Table 9, especially from the total of certificates of the first and second guilds, as they are chosen by peoples carrying on large business. These figures increase visibly as years go on, as seen from a comparison of the data for 1880 and 1890, while a less number of persons are occupied with huckstering or retail trade in small shops to-day than ten years ago.

Next, putting aside peculiarities belonging to parts of the Empire the fundamental data concerning the sum total of the commercial and manufacturing relations of the whole of Russia, namely, her foreign and home trade and manufacturing industry as far as they are recorded and expressed in large figures, giving an objective idea of the existing industrial and economical conditions of Russia, should be considered.

NUMBER OF TRADE CERTIFICATES AND LICENSES ISSUED IN 1880.

TABLE 9.

| 1880.<br>REGIONS.                     | First guild.  |           | Second guild. |           | Retail trade. |           | Industrial certificates. | Clerk certificates. | Sum of 2, 4, 6 and 7. | Sum of 2 and 4. |
|---------------------------------------|---------------|-----------|---------------|-----------|---------------|-----------|--------------------------|---------------------|-----------------------|-----------------|
|                                       | Certificates. | Licenses. | Certificates. | Licenses. | Certificates. | Licenses. |                          |                     | Thousands.            |                 |
|                                       | 1.            | 2.        | 3.            | 4.        | 5.            | 6.        | 7.                       | 8.                  | 9.                    | 10.             |
| Moscow-Central . .                    | 794           | 2,666     | 12,466        | 20,303    | 43,303        | 50,527    | 3,013                    | 32,102              | 77                    | 26              |
| Baltic-Petersburg .                   | 714           | 1,737     | 7,255         | 11,753    | 31,819        | 20,728    | 5,205                    | 25,658              | 38                    | 18              |
| Northern . . . . .                    | 35            | 225       | 1,352         | 2,485     | 4,487         | 6,142     | 319                      | 3,767               | 9                     | 8               |
| Eastern . . . . .                     | 229           | 1,284     | 7,214         | 14,052    | 22,132        | 36,866    | 2,301                    | 25,577              | 54                    | 15              |
| Siberia . . . . .                     | 169           | 566       | 3,208         | 4,650     | 7,324         | 7,804     | 1,003                    | 9,965               | 14                    | 5               |
| Central Asiatic . .                   | 46            | 298       | 1,660         | 3,374     | 5,946         | 13,164    | 1,937                    | 5,858               | 19                    | 4               |
| Caucasus . . . . .                    | 47            | 263       | 3,280         | 6,286     | 4,624         | 4,255     | 621                      | 4,330               | 11                    | 7               |
| Southern . . . . .                    | 339           | 1,230     | 8,128         | 13,057    | 29,583        | 29,227    | 6,208                    | 27,784              | 50                    | 14              |
| South-western . . .                   | 251           | 865       | 3,450         | 6,099     | 19,215        | 26,251    | 8,296                    | 20,743              | 42                    | 7               |
| Vistula . . . . .                     | 199           | 286       | 4,219         | 4,507     | 30,488        | 38,993    | 17,439                   | 13,167              | 61                    | 5               |
| North-western . . .                   | 134           | 327       | 2,919         | 4,719     | 15,799        | 23,851    | 12,380                   | 12,352              | 41                    | 5               |
| Little Russian . . .                  | 91            | 493       | 4,501         | 7,775     | 18,278        | 21,984    | 2,984                    | 14,694              | 33                    | 8               |
| Central Chernoziom.                   | 298           | 968       | 11,011        | 18,165    | 35,919        | 47,042    | 4,101                    | 29,807              | 70                    | 19              |
| Total (without Finland) in thousands. | 3.3           | 11.2      | 70.7          | 117.2     | 269.0         | 326.8     | 65.8                     | 224.8               | 520                   | 128             |

The importance of Russia's foreign trade, which is very considerable, as far as concerns the import of tea, cotton and machinery and the export of raw materials, especially breadstuffs, timber, flax and in general all kinds of productions of agricultural industry, falls into the background in respect to both importation and exportation, in comparison to the majority of goods produced by manufactories and mills, and this principally for the reasons that the consumption of these goods develops in Russia rather slowly and only in reference to goods of home origin, while their production in the majority of cases does not yet reach an amount sufficient to satisfy the growing home demands and furnish a surplus to foreign consumers. That the consumption of the above mentioned goods develops slowly is best proved by the fact that cotton fabrics, sugar, petroleum products and coal began to increase from the period when these goods began to be obtained within the country. Among those branches of manufacturing industry which have been developed in Russia sufficiently long under the influence of an existing home demand and protective duties, very many productions of manufactories and mills, after satisfying the home requirements, have already begun to find an issue abroad, a fact which serves to demonstrate that there already exist in Russia, albeit little developed, the conditions for a successful and most profitable business for a number of manufacturing industries. In proof, are quoted the

## NUMBER OF TRADE CERTIFICATES AND LICENSES ISSUED IN 1890.

TABLE 9.

| 1890.<br>Regions.                        | First guild.  |           | Second guild. |           | Retail trade. |           | Industrial certificates. | Clerk certificates. | Sum of 2, 4, 6, and 7. | Sum of 2 and 4. |
|--|---------------|-----------|---------------|-----------|---------------|-----------|--------------------------|---------------------|------------------------|-----------------|
|  | Certificates. | Licenses. | Certificates. | Licenses. | Certificates. | Licenses. |                          |                     |                        |                 |
|  | 1.            | 2.        | 3.            | 4.        | 5.            | 6.        | 7.                       | 8.                  | 9.                     | 10.             |
| Moscow-Central . .                       | 1,198         | 3,524     | 17,422        | 25,306    | 38,138        | 23,394    | 17,228                   | 39,083              | 70                     | 29              |
| Baltic-Petersburg .                      | 1,150         | 2,454     | 13,504        | 19,557    | 28,026        | 7,040     | 14,729                   | 36,803              | 44                     | 22              |
| Northern . . . . .                       | 34            | 197       | 1,648         | 2,633     | 6,110         | 3,338     | 1,015                    | 3,798               | 7                      | 8               |
| Eastern . . . . .                        | 273           | 1,229     | 10,556        | 16,442    | 31,749        | 21,799    | 4,424                    | 26,773              | 44                     | 18              |
| Siberia . . . . .                        | 141           | 590       | 5,619         | 7,498     | 10,101        | 4,468     | 1,906                    | 11,608              | 14                     | 8               |
| Central Asiatic . .                      | 48            | 435       | 1,681         | 2,397     | 11,189        | 23,546    | 2,082                    | 2,937               | 28                     | 8               |
| Caucasus . . . . .                       | 151           | 858       | 10,915        | 16,305    | 20,791        | 9,187     | 4,153                    | 13,319              | 30                     | 17              |
| Southern . . . . .                       | 512           | 2,004     | 14,320        | 21,107    | 34,797        | 18,790    | 6,523                    | 30,059              | 48                     | 23              |
| South-western . . .                      | 383           | 1,302     | 6,123         | 9,366     | 29,403        | 22,598    | 4,329                    | 17,532              | 38                     | 11              |
| Vistula . . . . .                        | 389           | 890       | 6,809         | 8,002     | 40,170        | 28,106    | 7,778                    | 13,534              | 45                     | 9               |
| North-western . . .                      | 211           | 580       | 5,251         | 7,463     | 25,743        | 18,352    | 3,987                    | 8,969               | 30                     | 8               |
| Little Russian . . .                     | 132           | 525       | 6,485         | 9,640     | 18,181        | 13,797    | 2,875                    | 12,044              | 27                     | 10              |
| Central Chernoziom.                      | 261           | 1,025     | 13,496        | 19,490    | 43,252        | 24,582    | 6,456                    | 29,211              | 52                     | 21              |
| Total (without Finland) in thousands . . | 4.9           | 15.6      | 113.8         | 165.2     | 337.6         | 219.0     | 77.5                     | 245.7               | 477                    | 182             |

data on exportation, during several years, of spirit, sugar and petroleum products. In the last column is cited by way of example the export of the production of the peasantry which has found a regularly increasing sale upon the markets of Western Europe, namely hen eggs. These illustrations show, that apart from breadstuffs Russia's export is capable of rapid growth and is assuming large economical proportions.

| EXPORT ACROSS ALL FRONTIERS. | Thousands of vedros, absolute alcohol. | Sugar and raw sugar in thous. pounds. | Petroleum products, million pounds. | Hen eggs, millions. | Total value, million roubles. |
|------------------------------|--|---------------------------------------|-------------------------------------|---------------------|-------------------------------|
| 1873. . . . .                | 1,000                                  | 1                                     | —                                   | 30                  | 3                             |
| 1884. . . . .                | 2,340                                  | 118                                   | 6.9                                 | 239                 | 20                            |
| 1887. . . . .                | 6,506                                  | 4,582                                 | 19.0                                | 507                 | 50                            |
| 1888. . . . .                | 5,335                                  | 5,581                                 | 34.9                                | 685                 | 68                            |
| 1889. . . . .                | 4,021                                  | 4,971                                 | 44.8                                | 609                 | 70                            |
| 1890. . . . .                | 4 257                                  | 3,313                                 | 48.1                                | 751                 | 60                            |
| 1891. . . . .                | 4,026                                  | 7,578                                 | 54.2                                | 834                 | 80                            |

The foreign export of Russian products of the manufacturing industry, as of agricultural, only in a still higher degree, depends upon the cheapness of the means of delivering these products at the frontiers of the Empire; and in this respect, in the last 20 years with the construction of railways, many goods have found an outlet, as shown in the Review published by the Ministry of Ways of Communication. This side of the business has only lately begun to develop, and that slowly. Furthermore, the Government protective tariff was brought to a completion only in the middle of 1891, when it already began to excite an increase in the manufacturing activity of Russia. Moreover, many deposits of natural wealth have now first become known and worked, such as the coal measures of the Donets, Transcaspian sulphur, Caucasian formations of natural Glauber's salt (the source of the cheapest production of soda and glass), the pyrites of the Ural, ores of nickel, mercury and manganese. Add to all this the fact that the price of labour in Russia is cheaper than in the majority of countries of the West, and it will appear that the manufacturing activity of Russia has before it an indisputable quickening and growth which will give the world's trade a mass of goods in whose increased production the national labour and capital will find a new source for heightening the prosperity of the country, not yielding to that furnished by its agricultural activity.

The low price of labour in Russia, referred to above, is an economical factor of so much importance as to deserve something more than a bare mention. The chief causes of the comparative cheapness of time and piece wages paid to workmen in the production of many manufactured articles in Russia are: 1. the great supply, the number of persons who must seek earnings outside of agriculture, that occupation being already very great as appears from the following calculation taken by way of example. For all the different kinds of labour expended in the production per pound of grain together with the collateral cultivations, as well as the associated labour in-

volved, the harvest being small, not more than three working days need be reckoned, while in the case of satisfactory harvests these will be not more than one day, and therefore assuming two days as the mean (The Rational Tariff, Mendeleev, 1892, page 145) and allowing the total cereal harvest of Russia to be equal to 2,500,000,000 pounds, which is certainly higher than the fact, the result would be that for purely agricultural activity Russia requires not more than 5,000 million working days. If however, it be reckoned that out of 120 million Russian inhabitants only 50 millions are occupied with work, and that the working time is limited to only 200 days in the year, it will result that there are 10,000 million working days, that is, at least twice as many as are required for agriculture, which again is in harmony with the fact that in the winter time agricultural occupations almost entirely cease; 2. The Russian workman, being to a certain extent secured by an allotment of land and by the comparative cheapness of bread and the other fundamental conditions of life, looks upon all earnings outside of agriculture, and especially upon winter and manufactory earnings as so much pure profit. If then, there is even the slightest competition in the offering of services he takes such work for an inconsiderable remuneration, the more so that otherwise he is confronted with the necessity of remaining idle, as in the manufactories and mills there are now only 1,500,000 persons employed; 3. The solicitude of the government about the condition of the workmen in the manufactories and works furnishes the workmen with the assurance that they are there much better secured than if they remained at their agricultural employments, as the inspectors of mines and factories take care that the masters in no way oppress the workmen and that they should get the necessary accomodation and hospital service, which does not obtain in the case of ordinary village life, or in that of hired agricultural labour.

Seeing that the indicated circumstances cannot by themselves be presented in their entirety in the shape of proofs, which shall be at the same time evident, comparative and numerical, it seems necessary to confirm the preceding fundamental position of the relative cheapness of labor in Russia by referring to a concrete case with the figures. The coal industry is taken as an illustration, because here the cost of the product clearly depends chiefly upon the wages, while the number of workmen is well known.

According to official data, for example in 1890, 367,000,000 pounds of coal were produced in Russia, the number of workmen employed being 40,571 and the selling price at the mines, from 2 to 8 kopecks a pound, or an average, never more than 6 kopecks. These figures show, assuming only 200 working days in the year (in the summer a part of the workmen leaving the mines), that there falls to the share of each workman, inclusive of all preliminary and general expenses in respect to mines, machines, sharings, management and owner's profit, 9,045 pounds, or 148 tons of coal a year; that is, about 542 roubles, or about 270 dollars per annum, or 45 pounds, and 2.70 roubles a day. The workman actually receives from 1 to 1.45 roubles, as I know from personal investigation of the Donets industry. In Great Britain, for example, in 1884 (Munro, British Association, 1885), 160,700,000 tons or 9,960,000,000 pounds are mined per year; the number of workmen employed is 520,000 and the average price per ton at the mines is not less than 9 shillings or about 7.25 kopecks per pound. Accordingly to each workman falls about 309 tons of coal, or about 1,390 roubles a year. Assuming 300 working days to the year, which

is about right for Great Britain, the result will be about 1 ton or 4.5 roubles per workman a day, that is, in Great Britain the workman gets in annual wages two and one-half times, and in day wages, about twice as much as the Russian miner: and this is so, although the prices of machinery and capital expended are indisputably higher than in England. The cause of so great a difference lies only in this, that the payment of workmen by the day or piece in Russia is about half of that paid in England.

A number of most profitable and important industrial undertakings may be founded upon the cheap labour of Russia and may freely compete with the corresponding industries of the west upon the condition, of course, of their attaining complete development and sufficient industrial and commercial credit. The attainment of this result is the more likely, the greater the degree in which wages enter into the price of the product. Competition and economic and social progress tend to reduce the price of all goods to such an extent that it may approach the sum paid to the workmen. As capital cheapens and may be directly or indirectly lowered in its value by state enterprises, it follows then that the industrial future on its external aspect, that is, apart from the development of the spirit of industrial enterprise, belongs beyond doubt to the countries possessing the conditions of cheap provisions and, therefore, comparatively cheap wages. Russia is assured these conditions not only for the present but for the far distant future. If this shall once be understood in all its integrity by the Russian people in the same measure as it is by the Government, the industrial success of Russia must follow rapidly, and there are many grounds for thinking that the present represents the stage of transition to this future epoch of the life of the Empire.

It must now be seen, and the same conclusion is to be deduced from the more minute estimate of the situation of some branches of Russian industry presented in this book, that the manufacturing activity of Russia cannot be regarded otherwise than as an earnest of the future. The history of the origin of the majority of the industries is still very recent, and the requirements of the people who still preserve the patriarchal character of their lives, are till now very simple. The preceding considerations also explain the commercial peculiarities of Russia in the foreign trade, the sale of raw materials and the demand for the machinery of new industries and for half-manufactured goods, which have not yet become firmly established in the country, in the home trade, the transport of grain and raw materials to the centres of industrial activity on the one hand, and the export from those centres of a few products of manufacturing activity not presenting any great variety, on the other. In this sense Moscow, St. Petersburg, Warsaw and Odessa are related to the majority of the other districts of Russia, as centres yielding the trade results of manufacturing industry, while receiving from them grain, fuel and every kind of raw material.

For the more accurate characterization of the foreign trade relations of Russia a quotation is made in the form of a short summary (Table 10), of the average annual result, in reference to the quantity by weight and the value of the principal groups of goods, distributing the raw and half-manufactured wares, alike imported and exported by Russia, according to their origin from the three natural kingdoms, and taking for this purpose the data for the five years from 1884 to 1888.

TABLE 10.

| E X P O R T S.  |                     |                      | I M P O R T S.   |                     |                      |
|---|---------------------|----------------------|--|---------------------|----------------------|
| PRINCIPAL ARTICLES OF EXPORTATION.  | Millions of pounds. | Millions of roubles. | PRINCIPAL ARTICLES OF IMPORTATION.                     | Millions of pounds. | Millions of roubles. |
| <b>MINERALS.</b>  |                     |                      | <b>MINERALS.</b>                                       |                     |                      |
| 1. Stones, principally phosphorites . . . . .                             | 3.3                 | 0.5                  | Marble, chalk, millstones . .                          | 8.6                 | 2.3                  |
| 2. Earths, clay to frontier places  | 0.1                 | 0.0                  | White and coloured clay . .                            | 2.3                 | 0.5                  |
| 3. Ores: manganese, iron, etc.  | 3.0                 | 1.4                  | To frontier districts. . . . .                         | 0.4                 | 0.3                  |
| 4. Salts, table salt . . . . .  | 0.5                 | 0.1                  | Chili saltpetre and table salt.                        | 2.3                 | 2.0                  |
| 5. Combustibles: raw petroleum, coal to Roumania.                         | 1.4                 | 0.8                  | Sulphur and coal, especially to Baltic ports . . . . . | 107                 | 14.5                 |
|   |                     | 3                    |  |                     | 20                   |
| <b>VEGETABLE GOODS.</b>   |                     |                      | <b>VEGETABLE GOODS.</b>                                |                     |                      |
| 6. Food: wheat, rye, oats and other grains . . . . .                      | 400                 | 330                  | Tea, coffee, fruits, spices, tobacco . . . . .         | 11                  | 88                   |
| 7. Parts of plants: flax, hemp, wood . . . . .                            | 162                 | 145                  | Cotton, indigo, olive oil . . .                        | 27                  | 115                  |
|   |                     | 475                  |  |                     | 203                  |
| <b>GOODS FROM THE ANIMAL KINGDOM.</b>                                     |                     |                      | <b>GOODS FROM THE ANIMAL KINGDOM.</b>                  |                     |                      |
| 8. Animals and meat: domestic animals, eggs . .                           | 8                   | 25                   | Chiefly herrings. . . . .                              | 5                   | 8                    |
| 9. Furs and wool . . . . .  | 4                   | 36                   |  | 0.7                 | 12                   |
| 10. Animal products: tallow, bones, butter. . . . .                       | 3                   | 10                   | Chiefly silk. . . . .                                  | 1.9                 | 4                    |
|   |                     | 71                   |  |                     | 24                   |
| <b>PRODUCTS OF WORKS.</b>   |                     |                      | <b>PRODUCTS OF WORKS.</b>                              |                     |                      |
| 11. Metals, sheet iron, etc. .  | 0.4                 | 2                    | Iron, cast iron, lead . . . . .                        | 19                  | 27                   |
| 12. Cement, glass and pottery.  | 2.1                 | 1                    | Chiefly cement and glass . .                           | 5                   | 5                    |
| 13. Chemical and dyes . . . .   | 0.2                 | 1                    | Chiefly soda and colours. . .                          | 4                   | 18                   |
| 14. Carbonaceous products, kerosene, leather, tar. . .                    | 29.4                | 19                   | Leather and coal, tar. . . . .                         | 1                   | 10                   |
| 15. Liquors and prepared provisions (spirit and sugar).                   | 8.1                 | 24                   | Wine and cheese. . . . .                               | 1                   | 10                   |
|   |                     | 47                   |  |                     | 70                   |
| <b>MANUFACTURED GOODS.</b>  |                     |                      | <b>MANUFACTURED GOODS.</b>                             |                     |                      |
| 16. Machines and metal goods, silver and steel . . . . .                  | 0.1                 | 1.9                  | Various machines and instruments . . . . .             | 3.9                 | 33                   |
| 17. Yarn and tissues . . . . .  | 1.1                 | 9.8                  | Fine yarn, costly tissues . .                          | 1.1                 | 46                   |
| 18. House furniture, clothes, travelling appliances . .                   | 0.1                 | 4.4                  | Iron ships, haberdashery. . .                          | 1.0                 | 10                   |
| 19. Paper, books, and other appliances of the arts and sciences . . . . . | 0.1                 | 1.0                  | Books, paper . . . . .                                 | 1.4                 | 12                   |
|   |                     | 17                   |  |                     | 101                  |
| Total . . . . .   | 627                 | 613                  | Total . . . . .  | 204                 | 418                  |

The average value of a pound of goods exported from Russia is less than a rouble, because the export of grain predominates, whose value closely approaches that sum. The goods imported into Russia, on the other hand, present a value per pound of more than two roubles, although coal exceeds half the imports by weight. Deducting this, there remain imports, about 96,000,000 pounds, to the amount of about 403,000,000 paper roubles. The average value, therefore, of a pound of imported goods exceeds 4 roubles which depends upon the predominance among the imports of such dear goods as tea, fruits, cotton, machines and yarn. The preponderance in weight of Russian exports over imports leads to the consequence that sea-going ships must often come into Russian ports in ballast.

Among the exports preponderate vegetable and animal raw materials, and to a certain extent the products of distilleries and refineries, such as spirit, sugar, and kerosene; in the imports, the two extremes of mineral raw material and manufactured goods. The former have been long in the enjoyment of a powerful customs protection, while upon their production within the country were levied considerable excise dues. The state of the imports proves that for the development of the economical life of Russia the most pressing needs at the present time are increased mining industries, works, manufactories and trades. It is of course not possible to have such complete information upon the home trade as upon the foreign. Judgments upon the former can only be formed upon the basis of two kinds of statistical information, the number of trade documents and the business done by commercial undertakings subject to income tax and assessment dues. Table 9, based upon data of the first kind, tables 6 and 11, upon data of the second kind, make it possible to form an opinion of the extent and distribution of the various forms of local industry. Further particulars referring to the home trade of Russia are set forth in the article upon the markets of Russia, inserted in this volume, and in a special publication of the Ministry of Ways of Communication, composed for the World's Columbian Exposition, in which are considered both the ways of communication themselves and the traffic over them.

It is most important to direct attention to the fact that with the development of the protective system the foreign trade of Russia, speaking in general terms, has not changed, has rather increased than diminished, while the home trade has unmistakably increased. In 1871 the foreign trade consisted of 369,000,000 roubles export, and of 380,000,000 roubles import, that is, the whole trade formed 749,000,000 roubles. In 1880 it was equal to 499,000,000 export and 604,000,000 import, total 1,103,000,000 roubles, at a time when the protective system had only begun to act, and that feebly. In 1890 it was equal to 704,000,000 exports and 416,000,000 imports, or total 1,120,000,000. In 1891, when in consequence of the lack of grain its export was forbidden for part of the year, thus diminishing the export trade, the latter was 722,000,000 roubles, the import 379,000,000 roubles, that is, in all 1,101,000,000 roubles or equal to the trade of 1880, with the sole difference that in 1880 the imports exceeded the exports, while in 1891, as latterly in general, the exports on the contrary have exceeded the imports. This preponderance of exports over imports may be judged by the data inserted in Table 7.

An idea of the increase during the last few years of the total trade, both home and foreign, may be gathered from the fact that the number of trade licenses,

guild and non-guild certificates and tickets, taken out (Table 9), and the tax received from them, have been growing manifestly, even within the comparatively short period of five years.

|      | Licenses to trade. | Tax upon licenses.  |
|------|--------------------|---------------------|
| 1885 | 1,094,238          | 21,770,174 roubles. |
| 1886 | 1,171,578          | 22,746,431 >        |
| 1887 | 1,171,186          | 23,623,007 >        |
| 1888 | 1,194,812          | 24,818,608 >        |
| 1889 | 1,235,858          | 25,053,146 >        |

Comparing the above stated number, 1,236,000 of trade certificates for 1889 (exclusive of 253,000 clerk certificates 983,000 will remain) with the number of commercial undertakings paying the assessed tax, their number being, as shown in Table 6, about 360,000, it will appear that the majority of such undertakings belong to the category of the small trades, a result which also follows from the fact that in 1889 there were issued for the whole Empire 23,000 first guild, 311,000 second guild certificates with the right of trading on a medium footing, and 648,000 certificates for petty trade and huckstering. Among the representatives of the last class of trade there are some 25,000 traders employed exclusively in the sale of articles as peddlars. This is due to the circumstance that many peasant wares circulate in Russia in the villages, through the medium of special hucksters, peddlars and costermongers, who often extend their visits to very remote regions of the country. Some of these traders barter their wares for flax, eggs, down, bristles and other products of peasant economy; in this way sometimes large quantities of goods are collected. Speaking generally, however, in Russia not more than one per cent of the inhabitants are employed in trade, or if the unskilled workmen occupied as accessories to trade and the families of traders be included, it may be estimated that about 3 to 4 per cent of the population in Russia are engaged in trade. This is about the proportion of persons deriving a livelihood from various kinds of mining and manufacturing activity (Table 12); and if a like number be reckoned as living upon trades and military and civil service the long recognised fact results, that the great bulk of the population of Russia, about 85 per cent, live upon the land. It cannot, however, be denied that this state of things in the present period of protection of the development of industry is changing somewhat.

The percentage of the inhabitants engaged in industry and trade is gradually increasing, a state of things which is justified not only by the facts communicated upon the first pages of this Introduction, especially by the cheapening of grain, but also by other considerations. For the tilling of the land and the care of agricultural operations in forms at all intensive in character, that is, with the employment of improved machinery, an incomparably less percentage of the population is required than that which is now engaged in farming in Russia. With the present course of things, the present prices of agricultural labour are much lower than those of all other kinds of occupations, a fact which is demonstrated by direct calculation in the writer's work, «A Rational Tariff», 1892, page 145, and in this Introduction. It may then be affirmed that it is only just to expect in the future a rise in the prices of agricultural products and a relative fall in those of all kinds of manufactured articles.



In Russia, again more often than in any other country, agricultural activity is able to be combined with the industrial and the commercial, which is based upon the fact that the peasants all have their lots of land and are able to devote a small portion of their time, especially the so-called *strada* or season of mowing hay and reaping grain when farming demands many hands, to agriculture; the greater part, and in particular the whole of the winter, they can give to manufactories and mills, or to the small household or domestic industries called *kustarny*. This very desirable combination of agricultural with industrial activity is realised in that form, called *kustarny* which is specially considered in Volume I of this work, prepared for the World's Columbian Exposition. There is no doubt but that these occupations form a large branch of the manufacturing industries of Russia, but it is impossible to have sufficiently exact information upon them as they are entirely free, not subject to any Government taxes and so escape registration. Some idea, however, of their extent may be at times obtained, an example of which is the leather industry, set forth in Chapter VI. Here according to the data extant collected by Professor Vylezhinsky it is reckoned that the production of the registered works being equal to 42,000,000 roubles a year, that of the *kustars* is about 58,000,000. It is further known that the household industry in the working up of various materiels into hardware, especially knives, locks, door appliances, nails et cetera, into woodworks, especially in the making of casks, wheels, carts, yokes, boxes and shovels, in the manufacture of articles from horn, as combs and buttons, in the preparation of pasteboard and many other manufactures, occupies a number of hands, and has every chance of competing with large manufacturing enterprises, especially with the help which is extended the *kustars* from the Government and Zemstvos.

By way of an example in support of the above view, may be cited the case of the cardboard industry in the Moscow government, which supplies apothecary shops and kindred houses. This trade is gradually passing from the manufactories into the hands of the *kustars*, thanks to the fact that the Zemstvos have taken the household industry of the Government under their special protection and have begun to supply the *kustars* themselves with the raw material used in their work. The conflict between the capitalist and the smaller enterprises may with such assistance take a different turn than ordinarily. It is known that the small undertakings of an industrial nature often perish when confronted with the competition of the great concerns. The cause of such ruin of the petty industries, general in all countries, must first of all be sought from an economical point of view in the importance of the capital lying at the disposition of the large undertakings, and from a technical point of view, in the adoption of large machines and appliances, for instance, blast furnaces, large motors and continuously acting furnaces. But the economical importance of capital can be weakened by the principle of the *artel*, or cooperation, the assistance of organs of local government, such as the Zemstvos, the influence of State enactments and the fall in the value of capital, expressed in a diminished rate of interest. All these factors are to-day, to a more or less extent, for one reason or another, taking place before our very eyes and constitute one of the forms of economical progress in which Russia is taking a manifest part. The technical influence of large machines and appliances, on the other hand, may be diminished in proportion as methods for the profitable subdivision of mechanical forces into small parts are

discovered, for example, by means of the extension of electric motors acting from central electrical stations. Further, comes the discovery of convenient methods of obtaining high temperatures and constant heat on a small scale. Towards both of these objects technical science is without doubt now striving, thus making manifest contributions on its part to the perfection of industrial and economical life. For these reasons it is impossible to consider that the last word has been pronounced in the struggle between large and small enterprises, and there is every hope that it will in time again appear most profitable and expedient to carry on part of the industries on a small scale, leaving only a portion of them to be handled as large enterprises, some of which will probably pass into the hands of the Government, as in the case of the railways.

It must be borne in mind that the *kustars* must receive raw material not only from agricultural industry, as for example, leather, horn, timber, but also from manufacturing industry, namely, metals and chemical products. It hence follows necessarily that the possibility of a wide development of household industry is possible only upon the condition of a simultaneous development of mining and manufacturing. The relative cost of machine work in the mills and factories, and upon hand work with the aid of a few tools only in household industry, indicates the limit to the extension of each of these forms of industry. At any rate, in the estimation of Russian industrial production according to the existing statistics, it is necessary always to bear in mind that the whole of household industry disappears in the existing accounts, and that it is in Russia very great.

There is yet one other vast form of industrial activity of Russia, which either entirely escapes registration or enters only partially, for example, into the accounts of the mining works. These are the government manufactories and mills, and such large undertakings as the railway companies. The needs of the Government, and in particular of the Departments of War and Marine, cause, on account of the limited character of private manufacturing enterprise, the frequent foundation of Government manufactories and mills. Such, for example, are the Department for the Preparation of Government Notes, which presents the most perfect institution in Russia for the manufacture of paper for engraving and printing, the mint, the laboratories for separating the noble metals, foundries, ordnance works, powder mills, factories for small arms, cartridge manufactories, tinned-provision manufactures, brass tube works, ship-building yards, works for making instruments used in measurement, and many others. The Government manufactories, in not a few cases, must be regarded as the founders of many kinds of industry in Russia. Such, for example, are the first cloth and paper manufactories, foundries, and porcelain works. They continue, however, in the majority of cases to exist only so long as private enterprise has not grown to a sufficient extent to satisfy the demand existing on the part of the Government. Many of the Government works thus represent only the first forms of the development of manufacturing industry in Russia. But as many forms of it, to judge from all that has been said above, are even now only in the primitive stages of their development, so there still exist not a few Government works, and manufactories of various kinds, which often escape registration. It is useful to keep this in view when considering the statistical data of the manufactories and mills.

In the annexed Table 11 is contained full information upon trade and industry, except mining and industries paying excise in Russia, without Finland, and with the omissions mentioned in connection with Table 6, according to the returns of the assessed and income taxes, which served in the construction of Table 6.

TABLE 11.

| ACCORDING TO THE DATA OF THE<br>INCOME AND ASSESSED TAXES FOR<br>1889, FOR ALL RUSSIA.       | SHARE UN-<br>DERTAKINGS |                            | GUILD UN-<br>DERTAKINGS. |                | SMALL UN-<br>DERTAKINGS. |                | TOTAL |
|--|-------------------------|----------------------------|--------------------------|----------------|--------------------------|----------------|-------|
|  | Profit.                 | Busi-<br>ness <sup>1</sup> | Profit.                  | Busi-<br>ness. | Profit.                  | Busi-<br>ness. |       |
| Millions of paper roubles.   |                         |                            |                          |                |                          |                |       |
| <b>Commercial undertakings:</b>  |                         |                            |                          |                |                          |                |       |
| 1. Banks <sup>2</sup> . . . . .  | 30.7                    | 1,535                      | 29.7                     | 4,026          | —                        | —              | 5,561 |
| 2. Insurance companies <sup>3</sup> . . . . .  | 3.9                     | 195                        | —                        | —              | —                        | —              | 195   |
| 3. Transportation <sup>4</sup> . . . . .   | 4.0                     | 200                        | 2.6                      | 34             | 0.3                      | 3              | 237   |
| 4. Water works, gas, electric lighting.  | 1.6                     | 80                         | —                        | —              | —                        | —              | 80    |
| 5. Trade in grain and other provi-<br>sions . . . . .  | —                       | —                          | 39.8                     | 1,004          | 19.0                     | 230            | 1,234 |
| 6. Trade in timber, furniture, flax<br>and hemp . . . . .                                    | —                       | —                          | 10.0                     | 193            | 1.8                      | 19             | 212   |
| 7. Trade in tissues, clothes, leather,<br>writing paper . . . . .                            | —                       | —                          | 43.6                     | 825            | 4.5                      | 45             | 870   |
| 8. Trade in metals and metal goods   | —                       | —                          | 10.3                     | 178            | 0.9                      | 9              | 187   |
| 9. " " glass, chemical and other<br>products. . . . .  | —                       | —                          | 8.4                      | 133            | 1.0                      | 1              | 141   |
| 10. Hotels, stores, baths, tobacco trade.  | 0.1                     | 5                          | 25.5                     | 345            | 22.5                     | 182            | 532   |
| 11. Contracts, offices, artels <sup>5</sup> . . . . .  | 0.1                     | 5                          | 0.4                      | 52             | 0.1                      | 1              | 58    |
| 12. Various trade concerns . . . . .   | 1.8                     | 90                         | 2.7                      | 39             | 1.6                      | 16             | 145   |
|  |                         |                            |                          |                |                          |                | 9,455 |
| <b>Industrial undertakings.</b>  |                         |                            |                          |                |                          |                |       |
| 1. Cotton goods. . . . .   | 21.4                    | 328                        | 4.1                      | 58             | 0.1                      | 2              | 488   |
| 2. Linen, hemp, bark goods . . . . .   | 2.9                     | 58                         | 1.9                      | 23             | 0.1                      | 2              | 88    |
| 3. Woollen goods. . . . .  | 2.0                     | 40                         | 3.3                      | 68             | 0.1                      | 1              | 109   |
| 4. Silk " . . . . .  | 0.1                     | 3                          | 1.4                      | 17             | 0.1                      | 1              | 21    |
| 5. Dyeing, dressing and printing tis-<br>sues . . . . .                                      | 1.5                     | 30                         | 2.4                      | 37             | 0.1                      | 1              | 68    |
| 6. Writing and other paper, book-<br>binding . . . . .                                       | 0.5                     | 11                         | 0.9                      | 15             | 0.2                      | 2              | 28    |
| 7. Leather, gutta-percha, shoes . . . . .  | 2.4                     | 47                         | 2.1                      | 33             | 0.5                      | 5              | 85    |
| 8. Woodwork, tannery, carpentry. . . . .   | 0.5                     | 9                          | 2.6                      | 35             | 0.7                      | 6              | 50    |
| 9. Metal works, machines, carriages  | 2.2                     | 44                         | 3.5                      | 55             | 1.3                      | 11             | 110   |
| 10. Glass, porcelain, cement . . . . .   | 0.8                     | 16                         | 2.4                      | 35             | 0.3                      | 3              | 54    |
| 11. Chemical goods, cosmetics. . . . .   | 1.2                     | 24                         | 1.0                      | 18             | 0.1                      | 1              | 43    |
| 12. Tallow, fats, oils, wax, stearin . . . . .   | 0.8                     | 16                         | 1.0                      | 17             | 0.8                      | 8              | 41    |
| 13. Food . . . . .   | 1.8                     | 36                         | 8.8                      | 126            | 2.2                      | 20             | 182   |
| 14. Mining <sup>6</sup> . . . . .  | 3.8                     | 76                         | —                        | —              | —                        | —              | 76    |
| 15. Spirit, sugar tobacco <sup>6</sup> . . . . .   | 8.6                     | 172                        | —                        | —              | —                        | —              | 172   |
| 16. Various industrial undertakings,<br>as tailoring, printing and photog-<br>raphy. . . . . | 1.7                     | 34                         | 5.8                      | 60             | 3.5                      | 31             | 125   |
|  |                         |                            |                          |                |                          |                | 1,740 |

<sup>1</sup> In the case of share undertakings only the profits are given. From them have been calculated the *conventional* amount of business, by multiplying the profit by 50 for trading, and by 20 for industrial undertakings.

<sup>2</sup> Except Government institutions.

<sup>3</sup> Mutual insurance is not included, because it does not bear income tax.

<sup>4</sup> Namely: tramways, steamers, various carrying enterprises; railways are not subject to tax.

<sup>5</sup> Contracts play the chief part in the figures of this column.

<sup>6</sup> Mining and excise-paying undertakings were not subject in 1889 to assessed tax, but only to income tax, which is paid by share undertakings; they are therefore placed in the Table only in the column of such enterprises.

It appears from the data of Table 11 that the operations of trade exceed those of the manufactories and mills, subject to income and assessed taxes, five and one-half times. Such a remarkable predominance of trade activity over industry depends not only upon the fact that in the first participate the products of agriculture, especially grain, the operations in which are very considerable both at home (Table 5) and abroad (Table 8; but upon the fact that trade in Russia has several stages of transmission, or intermediate steps, in passing from the producers to the consumers. This latter circumstance is determined both by the vastness of the distances dividing them from each other, and by the minute character of the trading institutions, all of which without exception are subject to record, although not all pay income or assessed taxes.

To judge of the distribution of the total production (Table 3) among the various forms of manufactories and mills, the data on the production of those not subject to excise, for the whole Empire except Finland, will be first given.

| MANUFACTURES.                           | 1880.          | 1890.         |
|---|----------------|---------------|
|   | PAPER ROUBLES. |               |
| Textile manufactures. . . . .           | 419,500,000    | 518,700,000   |
| Writing paper. . . . .                  | 16,000,000     | 22,300,000    |
| Wood work. . . . .                      | 19,000,000     | 33,400,000    |
| Metal > . . . . .                       | 115,600,000    | 148,800,000   |
| Ceramic industry, glass, cement. . . .  | 27,300,000     | 32,500,000    |
| Chemicals, colours. . . . .             | 13,400,000     | 23,900,000    |
| Leather and other animal products . .   | 97,600,000     | 74,300,000    |
| Comestibles . . . . .                   | 123,900,000    | 190,600,000   |
| Various industries not included above . | 9,400,000      | 18,600,000    |
|   | 848,000,000    | 1,064,000,000 |

These data of the Department of Trade and Manufactures do not include either the production of articles paying excise or mining works. Making use of the information upon this subject, and of that upon the income and assessed taxes (Tables 6 and 11), and adding the information concerning Finland, there results the following picture of the development of the whole of the larger industrial and manufacturing enterprises of Russia. The data are here distributed according to the kinds of goods produced, and in the order in which they are considered in the several Chapters of this Volume, with the addition of the facts about the mining industry. The following Table is based upon official sources, and answers approximately to the contemporary state of things; but it is impossible that it should be quite complete for a number of reasons, already explained above. The chief of these is that the minor

industries, and some of the Government works, do not appear in the present system of registration. Further, in many industries the prime material is derived from the products of other correlative manufactories and works; for example, cast iron and iron in the manufacture of machinery, hardware and cutlery, yarn in weaving, et cetera. Hence the total production shows a seeming exaggeration of the industrial activity, to perfectly correct which is, however, impossible without a minute analysis of all the separate cases. In the absence, then, of more detailed information it may be assumed that the indicated repetitions only in some degree make good the omission of Government and minor industries.

It appears from the above table that to each manufactory or works correspond about 47,500 roubles annual turnover, and about 43 workmen. The average figures show that the minor industrial undertakings do not enter into the number of manufactories and mills here taken into consideration. Besides this, attention should be directed to the fact that some of the Russian manufactories and works, especially cotton mills and metal works, reach very large dimensions. Thus, for example, 18 to 20 thousand workmen are employed in the cotton mill belonging to Savva Morozov at Nikolsk, government of Vladimir. The mills of Zakhari Morozov & Sons, Hill & Ditrich, that at Krenholm, and many others, as also the metal foundries of Demidov, Hughes, and others, also employ thousands of workmen.

Comparing the totals of the two last columns, it appears that on an average each workman corresponds to an annual turnover of about 1,100 roubles in the various mills and manufactories. The proportion per workman is least where the original plant and the raw material are cheap, and much hand labour is required. Such works, especially those connected with mining, evidently taking into account the abundance of cheap workmen and the restricted amount of free capital in the country, have the greatest chance of a successful and useful influence in Russia. Where also the raw material forms a fairly large share of the value of the finished goods, and where there is a great expenditure of mechanical and intelligent energy, a much more considerable amount of annual business corresponds to each workman, namely, two to three thousand roubles.

The figures noted further show that the number of workmen engaged in all the mills, manufactories, and mining industries of Russia does not exceed 1,500,000; in other words, does not constitute more than 1.25 per cent of the inhabitants. This insignificant proportion of the population earning their wages by manufacturing industry proves, like all that has been set forth above, that Russia is only entering into the circle of countries possessing an industrial character.

The primitive historical organization of Russia was principally territorial and political, which arose from the necessity of defending the country and establishing order in it. For this purpose, as has been seen, our people invited Princes to reign over them, and then organised themselves into a Tsardom, and then into an Empire. Thus did the agricultural mode of life of our country grow up under the influence of the principles of territorial security, always combined with a distribution of land.

TABLE 12.

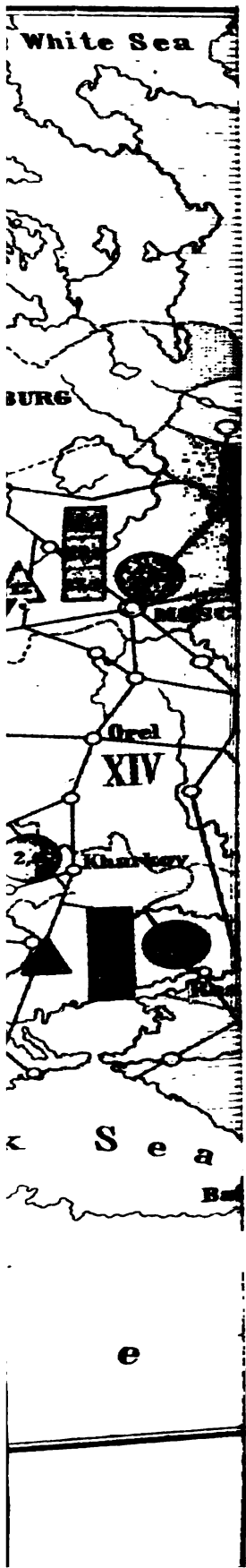
| MANUFACTORIES AND MILLS ARRANGED ACCORDING TO<br>ARTICLES PRODUCED, 1890.  | Manufacto-<br>ries and<br>mills. | Production<br>in millions<br>of paper<br>roubles. | Workmen in<br>thousands. |
|--|----------------------------------|---|--------------------------|
| 1. Cotton goods (yarn and tissues) . . . . .   | 912                              | 346   | 255                      |
| 2. Linen goods (scutching, spinning, weaving) . . . . .  | 174                              | 41  | 46                       |
| 3. Woolen goods (cleaning, wool spinning, weaving, felt,<br>carpets, cloth). . . . .                               | 1044                             | 106   | 95                       |
| 4. Silk goods (throwing, weaving, brocade). . . . .  | 254                              | 18  | 18                       |
| 5. Ropes, oil-cloth, hats, ribbons, knitted and plaited goods<br>made of fibres . . . . .                          | 509                              | 15  | 18                       |
| 6. Writing paper, wall papers . . . . .  | 357                              | 27  | 30                       |
| 7. Leather and leathern goods . . . . .  | 2690                             | 39  | 24                       |
| 8. Glue, tallow, wax, stearine, soap, bristles . . . . .   | 1159                             | 31  | 13                       |
| 9. Gutta-percha . . . . .  | 14                               | 11  | 4                        |
| 10. Saw mills, furniture, resin connected with wood . . . . .  | 1592                             | 40  | 42                       |
| 11. Gold (2,500 pounds), platinum, silver, mercury, copper,<br>lead, tin and zinc . . . . .                        | 1881                             | 58  | 106                      |
| 12. Cast iron (56,000,000 pounds) . . . . .  | 262                              | 61  | 233                      |
| 13. Iron and steel (nails, wire, machinery), copper, bronze,<br>gold and other goods made of metal, and machinery. | 1881                             | 186   | 118                      |
| 14. Salt (189,000,000 pounds), coal (367,000,000) and other<br>solid minerals. . . . .                             | —                                | 29  | 86                       |
| 15. Stone, lime, cement, bricks, porcelain, fayence, plaster<br>of Paris, glass and mirrors. . . . .               | 2345                             | 36  | 73                       |
| 16. Chemicals and cosmetics, colours, matches and powder.  | 846                              | 34  | 27                       |
| 17. Petroleum (260,000,000 pounds) . . . . .   | 160                              | 27  | 11                       |
| 18. Sugar (25,000,000 pounds) spirit, vodka, beer and tobacco  | 7241                             | 265   | 189                      |
| 19. Flour, meal, starch, molasses, macaroui, malt, and<br>sweetmeats. . . . .                                      | 7061                             | 169   | 38                       |
| 20. Other comestibles besides above (vegetable oils, pre-<br>serves, vinegar). . . . .                             | 2856                             | 28  | 11                       |
| 21. Carriages, musical instruments, pencils . . . . .  | 380                              | 35  | 16                       |
|  | 33683                            | 1597  | 1453                     |

Having given every peasant the right to land, Russia completed her epoch of the past, and began gradually to enter into the new era of mixed agriculture and industry. The conditions of universal peace and industrial progress which have called forth the World's Columbian Exposition are included in and contribute to, the interests of their new mode of life. The industrial successes of such mighty world units as the United States of America and Russia must contribute mightily to the brotherhood of peoples, under the influence of the all powerful principles of the Christian order of things. The friends of these principles will rejoice over the success of the Columbian Exposition in America, and over the entry of Russia upon the path of industrial progress, because thereby peace is assured from both West und East, as well as brotherly communion, the happiness of the masses, and a bloodless victory over nature, with the aid of the dissemination of that scientific knowledge which has become absolutely necessary for the success of contemporary industry.

**D. Mendeleeff.**

*St. Petersburg,  
February, 1893.*









## CHAPTER I.

## Cotton goods.

**T**HE manufacture of cotton according to its state of development should occupy the first place among other branches of Russian industry. Forming a subject of constant and special consideration by the Government, this industry has developed in magnitude and quality very rapidly, and at the present time has acquired such dimensions that it not only suffices for home consumption, but exports its products to foreign markets in annually increasing quantities.

## HISTORICAL REVIEW OF THE INDUSTRY.

The origin of the cotton manufacturing industry in Russia, although on a very small scale, must be dated back to the sixteenth century. The import of Eastern productions, namely, fustian, cotton flannel, domestic, shirting, turkey red, damask, figured counterpanes and tablecloths commenced much earlier. These textures pleased the Russians very much and their aim was to establish the industry in their own country.

Cotton manufacture on an enlarged scale commenced by using foreign imported yarns for textures in the first half of the eighteenth century. The yarn was distributed in the villages to the peasants to be worked up on hand looms into textures in general use among the people, namely, into nankeen, tricot, camlet, Chinese cotton cloth, coarse muslin sailcloth, domestic, shirting, calico, fustian and others. In a short time they began to establish small weaving mills, in appearance like roomy huts with large windows, where they erected from twenty to thirty looms and produced, by hired and piece work, cotton and linen textures. In the middle of the eighteenth century, in the Moscow and Vladimir governments, there was a considerable number of these establishments, and the manufacture of cotton goods began quickly to spread among the villages, displacing the weaving of linen cloths. At this period dyeing and calico printing made its appearance. The foundation of the industry was laid in the village of Ivanova in the

government of Vladimir. The inhabitants of Ivanova in the middle of the eighteenth century, besides agriculture occupied themselves with wool-cleaning and covering linen with oil paints. The first dyeing and calico printing mill was built about the years 1745 to 1750. This mill laid the foundation of printing, at the present time so widely spread in the manufacturing districts of the Vladimir government. At the end of the last century there were already several mills in Ivanova engaged in calico printing on a large scale, while at the same time the manufacture of Turkey red was commenced, which was destined to occupy a prominent position among other manufactures in dyed cotton textures. Turkey red was brought into Russia long ago from Bokhara and Persia, where it was first manufactured. The red textures were very much liked by the inhabitants and the demand became so great that the Bokharans and Persians founded in Russia, in the governments of Astrakhan, Kazan and Viatka several mills. Examining the produce of these mills in the present age a contemporary, a Saxon by birth, named John Voutich, found that in reference to the principles on which Russian tissues were dyed, they should occupy a place immeasurably above those of Western Europe.

From the commencement of the present century the manufacture of calico from English spun yarns began to spread from the Moscow and Vladimir governments into neighbouring parts, although the greater part remained in the Moscow districts, due to their proximity to the Moscow market. The demand for yarns increased so much that attempts were made to build their own spinning mills. The first cotton spinning mill was erected in Moscow in the year 1808 by a merchant, named Panteleyev. It is interesting to note that the machinery for this first Russian cotton mill was of Russian construction. In the same year was started the first power looms at the Alexandrovsk Manufactory in St. Petersburg. Up to the year 1812 the number of cotton spinning mills reached a total of eleven with 780 spinning machines. The military events of 1812 told heavily on the newly established industry and Russian finances, and for some time retarded the further progress of cotton manufacturing, but from the year 1820 it developed rapidly. In 1824 two large cotton spinning mills were opened, one in St-Petersburg and the other in Moscow; and in the third decade the manufacture of cotton tissues increased considerably, attracting a large number of persons and capital. The first cotton spinning mills had to battle with great difficulties in acquiring the necessary machinery, as it is well known that in England, where the construction of such machinery was first commenced, up to the year 1842 there existed a law prohibiting the export of such machinery to foreign countries, the infringement of which law was punishable by death. Notwithstanding these severe measures the machines were smuggled to foreign parts, and thus although with great difficulty, made their way into Russia. In the year 1842 the English Government sanctioned the free export of machinery, and the cotton spinning mills in Russia, as a natural consequence, developed still more rapidly. In 1843 there were 40 mills in Russia with a total of 350,000 spindles. The production of each spindle per year equalled about one pound of cotton yarn. In ten years there were 1,000,000 spindles at work; the product per spindle increased to an average of 48 pounds. The art of weaving, dyeing and calico printing grew simultaneously with that of cotton spinning.

An idea of the gradual development of cotton manufacture in Russia may be

had from the appended diagrams, Fig. 1 showing the import of raw cotton over the European frontier; Fig. 2, yarns and woven goods, knitted, plaited and corded.

Examining the line showing the quantity of imported cotton it cannot be denied that the development of Russian cotton manufacture has advanced with wonderful rapidity. The unchecked growth is broken only in the period between 1861 and 1865, when the import of American cotton to Europe was diminished to an extraordinary degree. Examining the other two lines, import of yarns and goods, it will be noticed that the amount of imports especially increased in the periods 1878 to 1880 and then diminished, but was nevertheless very much less than that of raw cotton. The increased import of yarns of medium counts from 1878 to 1880 was caused principally through the spinners taking advantage of the agitated state of all branches of cotton manufacture after the Russo-Turkish war, and the increased demand for yarns, which raised the prices disproportionately, and therefore obliged the weavers to apply to foreign manufacturers. Comparing the totals of imports of cotton, yarn and textures, one must come to the conclusion that the Russian production almost sufficed for internal wants in cotton manufactured goods. Yarns received from abroad consisted chiefly of fine counts the production of which in Russia was very small; they were used mostly for mixed and fine stuffs. The amount of imported yarns and textures when compared with the home product is very insignificant. To be convinced of this it is sufficient to compare the quantity of cotton received with that of yarns and textures.

FIG. 1.

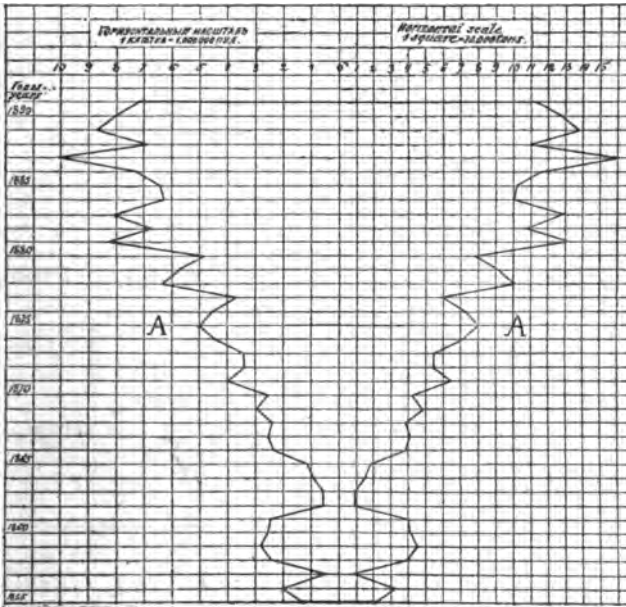


Fig. 1. Diagram of cotton imported over the European frontier, the left side showing millions of poods; the right side, tens of thousands of tons. To complete the information given in the diagrams the following table is appended :

## A. AMOUNT OF CUSTOM DUES.

| YEARS.  | RAW COTTON.              | YARNS.        | MANUFACTURED GOODS.      |
|---|--------------------------|---------------|--------------------------|
|   | Roubles paper per pound. |               | Roubles paper per pound. |
| 1855—1857 . . . . .                                   | 0.25                     | 6.50 to 15.20 | 0.83 to 7.20             |
| 1857—1868 . . . . .                                   | 0.25                     | 3.50 > 5.00   | 0.35 > 2.00              |
| From 1868. . . . .                                    | Free.                    | 3.25 > 4.25   | 0.28 > 1.20              |
| IN 1877 THE PAYMENT OF DUTIES IN GOLD WAS INTRODUCED. |                          |               |                          |
|   | Roubles gold per pound.  |               | Roubles gold per pound.  |
|   |                          |               |                          |
| 1877 . . . . .  | Free                     | 3.25 to 4.25  | 0.28 to 1.20             |
| 1879—1881 . . . . .                                   | 0.40                     | 3.25 > 4.25   | 0.28 > 1.20              |
| From 1882 . . . . .                                   | 0.45                     | 3.60 > 6.00   | 0.31 > 1.32              |
| > 1885 . . . . .                                      | 1.00 to 1.15             | 3.60 > 7.00   | 0.31 > 1.32              |
| > 1891 . . . . .                                      | 1.20 > 1.35              | 4.20 > 11.00  | 0.31 > 1.32              |

## B. AVERAGE ANNUAL QUANTITY AND VALUE OF IMPORTS.

| YEARS.              | RAW COTTON.         |                             |                               | YARNS.              |                             |                               | MANUFACTURED GOODS. |                             |                               |
|---------------------|---------------------|-----------------------------|-------------------------------|---------------------|-----------------------------|-------------------------------|---------------------|-----------------------------|-------------------------------|
|                     | Millions of pounds. | Millions of English pounds. | Value in millions of dollars. | Millions of pounds. | Millions of English pounds. | Value in millions of dollars. | Millions of pounds. | Millions of English pounds. | Value in millions of dollars. |
| 1877—1881 . . . . . | 5.8                 | 210                         | 31                            | 0.497               | 17.9                        | 9.3                           | 0.067               | 2.4                         | 2.4                           |
| 1882—1886 . . . . . | 6.9                 | 249                         | 39                            | 0.218               | 7.9                         | 5.1                           | 0.053               | 1.9                         | 1.8                           |
| 1887—1891 . . . . . | 8.1                 | 293                         | 41                            | 0.225               | 8.1                         | 4.4                           | 0.030               | 1.1                         | 0.9                           |

FIG. 2.

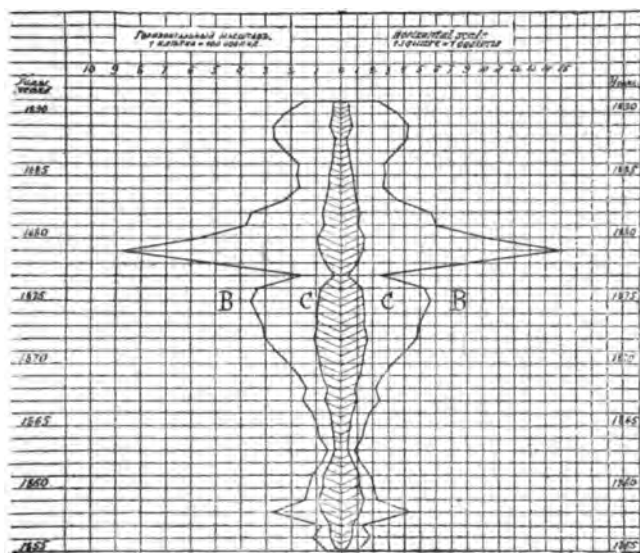


Fig. 2. Diagram showing imports by European frontiers: B, yarns; C, goods; left side, showing hundreds of thousands of pouds; right side, thousands of tons.

The relative amount in weight of imported yarns and goods to that of cotton consumed by spinning mills, is as follows:

| YEARS.              | IMPORTED.  |            |
|---------------------|------------|------------|
|                     | Yarns.     | Goods.     |
| 1855—1859 . . . . . | 8 per cent | 5 per cent |
| 1860—1864 . . . . . | 6 >        | 5 >        |
| 1865—1869 . . . . . | 5.5 >      | 3.5 >      |
| 1870—1874 . . . . . | 7.6 >      | 4 >        |
| 1875—1879 . . . . . | 8.5 >      | 2 >        |

From the above it will be seen that the Russian cotton manufacture during the years above mentioned increased to such an extent that the relative percentage of imports of yarn and cotton scarcely varied, but that the importation of cotton goods gradually decreased, and at the end of the seventh decade had sunk into insignificance. During the same period the exportation of Russian goods to Persia and Central Asia was more or less noticeable, and the import of Asiatic cotton increased.

Having traced the general development of the manufacture of cotton it will be interesting to turn to its detailed characteristic condition for the last fifteen years.

QUANTITY OF COTTON CONSUMED, ITS CLASSIFICATION AND QUALITY.

The import of cotton over the European frontier is shown in the following figures from official statistics:

| YEARS.                                       | Pounds. | Paper roubles. | Years.      | Pounds. | Paper roubles. | Years.      | Pounds. | Paper roubles. |
|--|---------|----------------|-------------|---------|----------------|-------------|---------|----------------|
| POUNDS AND PAPER ROUBLES GIVEN IN THOUSANDS. |         |                |             |         |                |             |         |                |
| 1877 . . .                                   | 3,680   | 35,324         | 1882 . . .  | 6,710   | 72,417         | 1887 . . .  | 10,056  | 96,436         |
| 1878 . . .                                   | 6,330   | 67,894         | 1883 . . .  | 8,090   | 93,864         | 1888 . . .  | 6,890   | 68,248         |
| 1879 . . .                                   | 5,720   | 60,004         | 1884 . . .  | 6,277   | 76,176         | 1889 . . .  | 8,620   | 83,509         |
| 1880 . . .                                   | 4,887   | 51,951         | 1885 . . .  | 6,378   | 65,967         | 1890 . . .  | 7,995   | 79,121         |
| 1881 . . .                                   | 8,217   | 84,499         | 1886 . . .  | 7,248   | 71,986         | 1891 . . .  | 7,131   | 69,397         |
| Average . .                                  | 5,767   | 59,934         | Average . . | 6,941   | 76,082         | Average . . | 8,138   | 79,342         |

Besides this during the period of 1887 to 1890 there were imported over the Asiatic frontier on an average about 900,000 pounds valued at 6,000,000 roubles. In this manner, the yearly imports of foreign cotton into Russia over both frontiers amounted latterly to 9,000,000 pounds. The foreign statistics refer to the import of American, Egyptian, East Indian and Persian cottons.

As regards the import of cotton from the Asiatic possessions of Russia, the consumption of which has rapidly increased, it is exceedingly difficult to give entirely trustworthy data on account of the absence of correct official information on the subject. Of the quantity of cotton supplied by the Russian possessions in Central Asia one can form an idea from the following statistics given of the annual production of the Russian plantations. Ginned cotton was obtained in Turkestan of late years as follows:

| FROM AMERICAN SEED. |               | FROM NATIVE SEED. |         |
|---------------------|---------------|-------------------|---------|
| 1884 . . . .        | 10,000 pouds. | 1888 . . . . .    | 476,784 |
| 1885 . . . .        | 30,000 "      | 1889 . . . . .    | 580,055 |
| 1886 . . . .        | 100,000 "     |                   |         |
| 1887 . . . .        | 212,000 "     |                   |         |
| 1888 . . . .        | 561,612 "     |                   |         |
| 1889 . . . .        | 608,325 "     |                   |         |
| 1890 . . . .        | 900,000 "     |                   |         |

From local statistics during the year 1892 there were 2,000,000 pounds of cotton gathered. It must be noted that part of the cotton from Central Asia goes for local consumption, and is worked up at home by the inhabitants.

Besides this Khiva and Bokhara supply annually for Russian manufacture about 1,000,000 pounds. The Russian spinning mills are also supplied with cotton from the

plantations in the Caucasus, which recently has reached the amount of about 400,000 pounds; thus the total amount of cotton worked up in Russia latterly is approximately estimated at 11,500,000 pounds, or about 185,000 tons. The greater portion of this quantity, about 9,000,000 pounds, falls to the lot of American, Egyptian, East Indian and Persian cottons, the lesser portion, about 2,500,000 pounds, consists of cotton from the Tashkend, Kokhand, Khiva, Bokharan and Caucasian cotton-growing districts. The different kinds of imported cotton used by the Russian manufactories are principally these: Upland, Texas, Savannah, Orleans, Mobile, white and brown Egyptian; and from East India, Dharwar, Broach, Dhollerah, Oomra, Veravul, Bengal, and Tinnevely. Those principally used are: middling, good middling and middling fair; the higher grades are used in smaller quantities.

Without dwelling on the generally known properties of the above mentioned kinds of cotton, it will be remarked in reference to Bokharan, Khiva, Samarkand, Tashkend, and also Caucasian cottons, that they are very similar to one another and are related to cottons of short and medium staples, and in quality are like the cottons of East India. The length of staple is unequal, and the fibres are rather coarse. The longest stapled cotton is that of Tashkend grown from American seed, and which for certain classes of yarn is preferred to the American. In colour it is white, with a yellowish tinge; in length, 20 to 27 millimetres, rather coarser than American, stronger but is not so clean. American cotton being softer forms a splendid material for weft. The Tashkend cotton is very suitable for preparing twist. Caucasian cotton, grown from fresh American seed, may be considered, as regards quality, as a very suitable material for spinning low and medium counts of yarn. Latterly, a visible improvement has shown itself in the matter of imperfect ginning and bad packing. The general wants of the Russian people in cotton manufactures are supplied almost completely by home productions, as is seen by the following statistics of import of foreign goods.

All kinds of unbleached, as well as bleached and dyed, and also sewing and knitting yarns imported in recent years are indicated below:

| Years.                                       | Pounds. | Paper roubles. | Years.       | Pounds | Paper roubles. | Years.       | Pounds. | Paper roubles. |
|--|---------|----------------|--------------|--------|----------------|--------------|---------|----------------|
| POUNDS AND PAPER ROUBLES GIVEN IN THOUSANDS. |         |                |              |        |                |              |         |                |
| 1877 . . . .                                 | 158     | 5,987          | 1882 . . . . | 355    | 15,223         | 1887 . . . . | 219     | 9,644          |
| 1878 . . . .                                 | 504     | 16,768         | 1883 . . . . | 226    | 10,438         | 1888 . . . . | 263     | 10,026         |
| 1879 . . . .                                 | 875     | 30,428         | 1884 . . . . | 166    | 8,542          | 1889 . . . . | 271     | 9,836          |
| 1880 . . . .                                 | 568     | 20,785         | 1885 . . . . | 174    | 7,775          | 1890 . . . . | 228     | 8,609          |
| 1881 . . . .                                 | 381     | 14,276         | 1886 . . . . | 169    | 7,690          | 1891 . . . . | 145     | 4,904          |
| Average. . .                                 | 497     | 18,049         | Average. . . | 218    | 9,934          | Average. . . | 225     | 8,604          |

On the strength of the foregoing statistics it must be confessed that the import of manufactured cotton yarn, if the home production be taken into consideration, is



very insignificant. The production of Russian cotton spinning mills of late years, has been 10,000,000 pounds of yarn annually, and consequently the import of foreign goods into Russia is only two and a half per cent of the home production. The principal receipts, as shown by the customhouse accounts, are sewing, knitting and also doubled yarns, prepared from fine counts, of which little is produced in Russia. As regards the import of low counts, below № 45, which form the principal part of Russian production, the amount imported is very small. The manufacture of sewing cotton has recently developed in Russia and promises soon to meet the home demands. The import of manufactured cotton goods is less significant than the import of yarns, in relation to the quantity of such goods manufactured in Russia.

For the last fifteen years, the imports were as follows:

| Years.                                       | Cotton tissues, gray, white coloured and checked, excepting those dyed in Adrianople red. |                | Cotton cording, knitting and plaiting goods. |                | Years.         | Cotton tissues printed and dyed in Adrianople red. |                | Cotton velvet, plush and ribbon velvet. |                |
|--|---|----------------|--|----------------|----------------|--|----------------|---|----------------|
|  | Pounds.   | Paper roubles. | Pounds.                                      | Paper roubles. |                | Pounds.  | Paper roubles. | Pounds.                                 | Paper roubles. |
| POUNDS AND PAPER ROUBLES GIVEN IN THOUSANDS. |   |                |  |                |                |  |                |   |                |
| 1877 . . . . .                               | 11.9  | 765            | 9.1  | 678            | 1877 . . . . . | 6.0  | 462            | 1.4                                     | 130            |
| 1878 . . . . .                               | 28.9  | 1,884          | 20.0   | 1,352          | 1878 . . . . . | 11.1   | 984            | 4.0                                     | 429            |
| 1879 . . . . .                               | 36.5  | 2,266          | 26.0   | 1,772          | 1879 . . . . . | 15.5   | 1,344          | 5.2                                     | 602            |
| 1880 . . . . .                               | 42.2  | 2,220          | 26.0   | 1,688          | 1880 . . . . . | 16.2   | 1,407          | 6.7                                     | 703            |
| 1881 . . . . .                               | 34.2  | 1,983          | 22.0   | 1,443          | 1881 . . . . . | 0.5  | 676            | 5.1                                     | 604            |
| Average . . .                                | 30.7  | 1,824          | 20.6   | 1,387          | Average . . .  | 11.5   | 975            | 4.5                                     | 494            |
| 1882 . . . . .                               | 29.6  | 1,839          | 27.0   | 2,018          | 1882 . . . . . | 12.6   | 1,126          | 4.2                                     | 458            |
| 1883 . . . . .                               | 30.6  | 1,648          | 15.0   | 1,018          | 1883 . . . . . | 10.7   | 879            | 3.6                                     | 339            |
| 1884 . . . . .                               | 26.9  | 1,555          | 11.0   | 686            | 1884 . . . . . | 8.8  | 840            | 3.0                                     | 304            |
| 1885 . . . . .                               | 24.0  | 1,332          | 8.9  | 588            | 1885 . . . . . | 7.6  | 698            | 3.6                                     | 318            |
| 1886 . . . . .                               | 21.1  | 1,167          | 7.1  | 466            | 1886 . . . . . | 5.3  | 397            | 3.0                                     | 233            |
| Average . . .                                | 26.4  | 1,503          | 13.8   | 955            | Average . . .  | 9.0  | 788            | 3.5                                     | 340            |
| 1887 . . . . .                               | 18.4  | 926            | 6.1  | 408            | 1887 . . . . . | 3.9  | 282            | 2.7                                     | 226            |
| 1888 . . . . .                               | 14.5  | 768            | 4.9  | 353            | 1888 . . . . . | 3.0  | 232            | 1.8                                     | 167            |
| 1889 . . . . .                               | 20.4  | 1,104          | 7.7  | 517            | 1889 . . . . . | 4.6  | 333            | 2.0                                     | 180            |
| 1890 . . . . .                               | 19.3  | 1,014          | 6.4  | 413            | 1890 . . . . . | 5.5  | 381            | 1.1                                     | 97             |
| 1891 . . . . .                               | 16.2  | 818            | 6.0  | 388            | 1891 . . . . . | 5.5  | 391            | 1.3                                     | 109            |
| Average . . .                                | 17.8  | 926            | 6.2  | 416            | Average . . .  | 4.5  | 324            | 1.8                                     | 156            |

From this it is seen that the import of manufactured cotton tissues has been for a long time very small, and that it gradually decreases in all sections. If the yearly returns be taken of home production at 9,600,000 pounds of manufactured cotton

goods, then the relative import of foreign manufactures in recent years must be estimated at the following rate: imported gray, bleached and dyed goods, excepting goods dyed Adrianople red, 0.2 per cent; printed and dyed in Adrianople red, 0.05 per cent; velvet, plush and ribbon velvet, 0.02 per cent; total amount of imported textures, 0.27 per cent. Thus the import of cotton manufactured tissues of foreign make form an insignificant item in comparison with the Russian production, and do not exceed one three-hundredth part of the whole of the Russian consumption. In reference to the value of imports, taking the produce of the Russian cotton manufacturing industry of late years approximately at 340,000,000 roubles, it must be presumed that the value of foreign cottons imported form about 25 per cent; yarns, 2.5 per cent; goods, about 0.05 per cent; total, about 28 per cent of the value of goods produced by the Russian manufactories. In valuing the statement of imports the export trade must be taken into consideration. Russia exports manufactured cotton goods principally to Turkey, Bulgaria, Roumania, Persia and China. The most important export trade is carried on with Persia, whose demand for Russian manufactured goods yearly increases. Of this fact one may be convinced by the following statistics.

In 1883 the imports to Persia of Russian manufactured goods scarcely reached 5,200 pounds, while of late years there have been exported:

|              | 1887.  | 1888.  | 1889.  | 1890.   |
|--------------|--------|--------|--------|---------|
| Pounds . . . | 18,934 | 24,867 | 26,306 | 31,241. |

Therefore, recently the exports have been six times greater than they were in 1883. Comparing the totals of foreign Russian trade it must be acknowledged, in respect to quantity, that the export of Russian manufactured cotton goods fully covers the import of goods of foreign make.

#### THE YEARLY RETURNS OF THE INDUSTRY.

From data collected by the Department of Trade and Manufacture, the output of the cotton manufacturing industry of Russia for late years is shown by the following figures:

| YEARS.                  | Spinning. | Weaving. | Printing and dyeing | Finishing | Total. |
|-------------------------|-----------|----------|---------------------|-----------|--------|
| IN MILLIONS OF ROUBLES. |           |          |                     |           |        |
| 1880. . . .             | 74.1      | 99.7     | 61.1                | 5.5       | 240.4  |
| 1881. . . .             | 89.3      | 124.6    | 58.4                | 2.9       | 275.2  |
| 1882. . . .             | 99.3      | 137.5    | 60.7                | 3.3       | 300.8  |
| 1883. . . .             | 97.6      | 116.7    | 60.4                | 3.2       | 277.9  |
| 1884. . . .             | 91.4      | 109.3    | 58.8                | 2.8       | 262.3  |
| 1885. . . .             | 97.4      | 98.0     | 59.5                | 3.3       | 258.2  |
| 1886. . . .             | 93.9      | 107.2    | 47.8                | 3.9       | 252.8  |
| 1887. . . .             | 105.7     | 104.3    | 63.7                | 4.4       | 278.1  |
| 1888. . . .             | 133.6     | 157.2    | 75.3                | 4.7       | 370.8  |
| 1889. . . .             | 187.6     | 222.3    | 72.8                | 4.4       | 487.1  |

The above mentioned figures cannot be taken as quite correct, as it is impossible to accurately divide the industry into all its departments because, besides separate spinning, weaving and dyeing mills, there exist many manufactories embracing two or three of these branches, whilst the report of the yearly output of each branch in such manufactories is not given, but taken in totals. A more accurate valuation of the product of the cotton manufacturing industry may be formed by the following calculations. The yearly amount of cotton used by the spinning mills is about 11,500,000 pounds. The yarns spun in Russia are principally of medium and low counts, so that their average ranges between Nos. 23 to 28, which gives about 35 pounds of yarn per pound of cotton (87.5 per cent), 1.75 pounds of waste (4.4 per cent), and 3.25 pounds of dead loss (8.1 per cent). Thus the general production of cotton spinning mills may be accurately taken at ten million pounds. Out of this quantity 9,600,000 are converted into tissues which, taken at an average price of thirty-five roubles per pound for finished goods, forms a sum of about 340,000,000 roubles. Part of the remaining quantity goes for other purposes and part is lost in the manufacture of tissues. Therefore, not taking into consideration the accessory products, as wadding and preparation of knitting yarns and others the value of which is of no great amount, the production of the Russian cotton manufacturing industry may be estimated at 340,000,000 roubles.

#### TECHNICAL MEANS OF MANUFACTURE.

As regards the technical means possessed by the Russian cotton industry, the number of spindles and power looms in European Russia are shown in the table on page 11, as well as the number of mills, in 1877 and in 1886, with their distribution in the Empire, and the information given may be considered as thoroughly authentic.

The number of working hours in Russian manufactories is not uniform, but varies from twelve to twenty-four hours per diem. The number of working days during the year may be estimated approximately at 280. In foreign mills, in the majority of cases, the number of working days is estimated at 300, of ten hours each. Out of the total number of spindles and looms in Russian mills in 1877 there were at work:

| Time.               | Spindles. | Looms. |
|---------------------|-----------|--------|
| 24 hours per day. . | 1,489,851 | 41,037 |
| 12 » » » . .        | 1,306,432 | 13,529 |

Converting these figures to an equivalent of 300 days of ten hours work, the results will be 4,800,470 spindles and 107,075 looms.

In 1886 there were at work:

| Time.              | Spindles. | Looms. |
|--------------------|-----------|--------|
| 13.5 hours . . . . | 2,322,090 | 42,335 |
| 18 » . . . .       | 641,590   | 12,577 |
| 21 » . . . .       | 272,986   | 7,067  |
| 24 » . . . .       | 456,788   | 17,835 |
| Not at work . . .  | 219,352   | 4,702  |

| Districts.   | N U M B E R O F S P I N D L E S.   |          |        |         |         |           |          |           |         |           | Number of power looms. |         |         |           |        |        |
|--------------|------------------------------------|----------|--------|---------|---------|-----------|----------|-----------|---------|-----------|------------------------|---------|---------|-----------|--------|--------|
|              | 1877.                              |          |        |         |         | 1886.     |          |           |         |           | 1877                   | 1876.   |         |           |        |        |
|              | Mule.                              | Throstle | Total. | Mule.   | Flyer.  | Throstle. | Ring.    | Total.    |         |           |                        |         |         |           |        |        |
| M O S C O W. | Number of mills.                   |          |        |         |         |           |          |           |         |           |                        |         |         |           |        |        |
|              | 1877.                              |          |        |         |         |           |          |           |         |           | 1886.                  |         |         |           |        |        |
|              | Spinning                           |          |        | Weaving |         |           | Spinning |           |         | Weaving   |                        |         |         |           |        |        |
|              | 18                                 | 35       | 24     | 34      | 615,382 | 25,044    | 640,426  | 811,608   | 2,624   | 146,474   | 960,706                | 16,283  | 24,205  |           |        |        |
|              | 10                                 | 29       | 11     | 36      | 353,934 | 48,764    | 402,698  | 424,558   | 20,420  | 92,616    | 537,594                | 13,421  | 20,987  |           |        |        |
|              | 4                                  | 5        | 5      | 6       | 182,560 | 28,096    | 210,656  | 182,628   | 18,984  | 33,572    | 235,184                | 5,053   | 5,139   |           |        |        |
|              | 1                                  | 1        | 2      | 1       | 99,482  | 4,088     | 103,550  | 177,920   | —       | 11,824    | 189,744                | 944     | 1,002   |           |        |        |
|              | 1                                  | 3        | 1      | 4       | 68,769  | 26,420    | 95,189   | 118,000   | 3,400   | 19,400    | 140,800                | 349     | 1,693   |           |        |        |
|              | 1                                  | 1        | 1      | 1       | 26,676  | —         | 26,676   | 36,724    | —       | 29,568    | 66,292                 | 500     | 750     |           |        |        |
|              | —                                  | 9        | 1      | 15      | —       | —         | —        | 23,704    | —       | 4,488     | 30,192                 | 3,675   | 6,716   |           |        |        |
|              | 1                                  | 1        | —      | —       | 5,564   | —         | 5,564    | —         | —       | —         | —                      | —       | —       |           |        |        |
| 1            | —                                  | —        | —      | 4,200   | —       | 4,200     | —        | —         | —       | —         | —                      | —       |         |           |        |        |
|              | Total in Moscow districts.         |          |        | 37      | 84      | 45        | 97       | 1,356,547 | 132,412 | 1,488,959 | 1,777,112              | 45,428  | 337,942 | 2,160,512 | 40,260 | 60,522 |
|              | Kherson                            |          |        | —       | —       | —         | —        | —         | —       | —         | 2,400                  | 7,788   | 480     | 10,668    | —      | 122    |
|              | Tiflis                             |          |        | —       | —       | —         | —        | —         | —       | —         | 5,600                  | —       | 5,200   | 10,500    | —      | 284    |
|              | Perm.                              |          |        | 1       | 1       | —         | —        | 2,100     | 400     | 2,500     | —                      | —       | —       | —         | 75     | —      |
| Petersburg.  | St. Petersburg                     |          |        | 13      | 10      | 12        | 11       | 691,604   | 58,516  | 750,120   | 666,392                | 28,482  | 97,104  | 791,978   | 6,606  | 8,554  |
|              | Baltic Provinces.                  |          |        | 4       | 3       | 4         | 3        | 173,896   | 107,592 | 281,488   | 229,966                | 108,472 | 9,904   | 348,362   | 2,016  | 2,237  |
|              | Total in St. Petersburg districts. |          |        | 17      | 13      | 16        | 14       | 865,500   | 166,108 | 1,031,608 | 896,378                | 136,954 | 107,008 | 1,140,340 | 8,622  | 10,791 |
|              | Vistula districts                  |          |        | 9       | 6       | 13        | 8        | 173,480   | 43,160  | 216,640   | 379,248                | 26,856  | 93,518  | 505,622   | 4,417  | 10,572 |
|              | Finland.                           |          |        | 3       | 2       | 3         | 2        | 16,500    | 40,076  | 56,576    | 30,884                 | 45,110  | 8,860   | 84,864    | 1,192  | 2,223  |
|              | Total.                             |          |        | 67      | 106     | 79        | 123      | 2,414,127 | 382,156 | 2,796,283 | 3,091,652              | 262,146 | 553,003 | 3,912,806 | 54,566 | 81,516 |

From the above quotations a similar calculation would find 5,561,962 spindles and 128,273 looms. Thus for the last ten years the number of spindles has increased approximately sixteen per cent and the number of looms, twenty per cent. At the present time the number of spindles in Russia may be estimated at 6,000,000 and the number of looms at 200,000, taking 300 days per annum of ten working hours.

Speaking of the technical means of production it will be interesting to become acquainted with the number of workpeople engaged in the cotton manufacturing industry. According to statistics for 1889 there were employed in the spinning and weaving mills 211,000 people; out of this number 110,000 hands were engaged in weaving for 200,000 looms, and about 100,000 in spinning for 6,000,000 spindles. In this manner it results that there are in Russia about two looms and sixty spindles per workman. In comparing the relative production with that of England it will be seen that there is more labour spent in Russia than in England, but it would be erroneous to explain this fact by attributing it to the comparative incapability of the Russian workpeople, as on the contrary they must be credited with great ability and endurance. In fixing the relative amount of labour dependent on the number of spindles and looms it is necessary to take into consideration the commercial side of the question, the influence of which is the principal cause of the above mentioned difference. Although in both countries the same ends are aimed at, namely, to attain the cheapest production, in consequence of the different conditions of labour, in England machinery being cheap and labour dear and in Russia *vice versa*, it is attained by different means. This can be easily seen by examining the working of spinning machines and looms. In England the carriages of self-acting mules make fewer stretches per minute than those working in Russia, in consequence of which the production of the machine is reduced, but at the same time there are fewer broken ends, which reduces the amount of labour required. By this means the loss in production is recompensed by the smaller amount paid for labour. In like manner in Russian mills the number of picks made by the looms per minute is greater than those in the English manufactories, calling for greater manual labour for piecing broken ends in the warp and changing weft caps, so that an English workman can be entrusted with four looms or more, while a Russian, in consequence of the higher speed, cannot be given more than two.

#### COMPARISON OF RUSSIAN AND FOREIGN INDUSTRIES.

To be able to determine the position occupied by the Russian cotton industry amongst foreign industries, a comparison should be made of the technical means possessed by the different nations and the quantity of raw cotton used. From statistics given by Thomas Ellison, of recent years the number of spindles in the world may be seen by the following figures:

|                          | 1881.                        | 1884.  | 1886.  | 1888.  | 1891.  |
|--------------------------|------------------------------|--------|--------|--------|--------|
|                          | SPINDLES GIVEN IN THOUSANDS. |        |        |        |        |
| England . . . . .        | 40,600                       | 42,750 | 42,700 | 42,740 | 44,000 |
| The Continent. . . . .   | 21,245                       | 22,650 | 22,900 | 23,380 | 25,050 |
| Total in Europe. . . . . | 61,845                       | 65,400 | 65,600 | 66,120 | 69,050 |
| United States. . . . .   | 11,375                       | 13,300 | 13,400 | 13,550 | 14,774 |
| East India . . . . .     | 1,513                        | 2,002  | 2,262  | 2,489  | 3,352  |
| World's Total. . . . .   | 74,733                       | 80,702 | 81,262 | 82,159 | 87,176 |

In the year 1870 the number of spindles was estimated at 70,334,000, so that during a period of twenty years they have increased 22 per cent, and for the last ten years the increase has been nearly 17 per cent. The number of spindles in Russia form about one-quarter of those of the continent of Europe and about one-seventh of those of England. The distribution of spindles in the European powers is as follows:

|                   |            |                       |           |
|-------------------|------------|-----------------------|-----------|
| England . . . . . | 44,000,000 | Germany . . . . .     | 5,000,000 |
| Russia . . . . .  | 6,000,000  | Switzerland . . . . . | 1,850,000 |
| France . . . . .  | 5,039,000  | Austria . . . . .     | 2,093,000 |

Thus in quantity of spindles Russia occupies the first place in Europe after England.

The amount of cotton used in the world in the seasons of 1890 and 1891 was as follows:

|                              |                                       |
|------------------------------|---------------------------------------|
| England . . . . .            | 4,270,000 bales (400 English pounds). |
| Continent of Europe. . . . . | 4,480,000   >   >   >   >             |
| Total in Europe . . . . .    | 8,750,000   >   >   >   >             |
| United States . . . . .      | 3,171,000   >   >   >   >             |
| East India . . . . .         | 1,058,400   >   >   >   >             |
| World's total . . . . .      | 12,979,400                            |

Taking into consideration that in Russia about 11,500,000 pounds, that is, about 1,040,000 bales of 400 English pounds each are worked up annually, it is seen that the Russian industry consumes about one-quarter the amount used in English manufactories. The yearly consumption of cotton per spindle in England is 36.4 English pounds; in Russia, 69.2 English pounds; on the continent in general, 69 English pounds; in the United States, 76 English pounds. The above comparison shows that the amount of raw cotton used in Russia per spindle is nearly double that of England. The reason of this is that in England fine counts are spun, as well as medium and coarse, whereas in Russia spinning is principally devoted to medium and low counts of yarn.

## CHARACTERISTICS OF THE INDUSTRY.

The Russian cotton spinning industry, in general, does not go beyond the spinning of medium numbers and is limited to № 70. The annual average counts are 28, approximately. The chief portion of yarns spun forms Nos. 30 to 34 twist, and Nos. 34 to 38 weft. In Russia the English system is adopted for numbering cotton yarns, that is, the counts are arrived at by the number of hanks of 840 yards each per English pound. These numbers are used for the manufacture of calico, which is finished by bleaching, dyeing and printing. Fine counts are made in a comparatively small quantity, although of recent years progress has been made in this direction. Many of the existing spinning mills have commenced spinning fine counts; moreover, new mills have been erected especially for this purpose and spin up to Nos. 125 and 130, doubling them into sewing cottons or supplying weaving mills for the manufacture of mixed goods. The competition in manufacturing fine counts and sewing cottons in Russia is limited to the English manufacturers, such as Coats, Clark, and others, to compete with whom is a matter of great difficulty. Consequently the whole of Russian cotton spinning must be classed as medium and low counts. Generally speaking the Russian spinning mills do not make a specialty of spinning certain counts; each mill, in the majority of cases, produces a whole assortment of numbers striving more or less to get the full amount of yarn out of a given quantity of raw cotton. In conformity to this, mixings of cotton are prepared from which different numbers of yarn are made, for instance: for mule weft, Nos. 6 to 10, American cotton is used, or a mixture of Asiatic cotton with waste; for Nos. 30 to 50 twist, American or Egyptian; for weft, Nos. 30—50 American, or Nos. 60—70 Egyptian; for throstle spinning, Nos. 12 to 18, Asiatic or Nos. 22 to 40, American or Egyptian, and so forth. Cotton tissues fabricated in Russia consist principally of prints and self colours, Turkey red, and the minor part, of bleached goods. The printed goods of Russian manufacture in all respects answer the demands of modern times. With the great variety of colours and styles of finish, they are capable of satisfying the buyer of refined and ordinary tastes. The printed goods of the Moscow and Serpoukhov mills may be fearlessly placed on a par with similar goods from the best Mulhausen and Rouen print works. As regards calendered and red prints, which have such a widespread sale throughout the Empire and also in the neighbouring Asiatic possessions, they may be said to have justly earned a good reputation among foreigners.

It must be remembered with regard to the characteristic development of Russian industries for the last twenty years that, besides the improvement in quality, the manufacture of cheap and heavy goods has developed at the same time, which to a certain extent is able to compete with woollen goods and like prints, and supplies the wants of the poorer classes of inhabitants. The above product takes the form of heavy, printed goods, such as printed fustians, cotton cloth, tricot and others, the manufacture of which was copied from Saxony and first made at the Pabianitsk mill, Kroushay, in the Polish district, which was converted in 1873 from a shoddy mill into that of cotton manufacturing. The material thus manufactured is taken in the unbleached state and dyed in dark colours, after which it is printed upon in still darker shades. These fustians began to spread rapidly among the poorer classes of consumers, and as the demand for printed fustians yearly increased the Pabianitsk manufacturers began to

have competition in neighbouring mills, as well as in the Moscow districts. Then, to the manufacture of printed fustians was added that of printed cotton cloth, or buckskin, which at once found a good sale amongst the poorer classes, displacing similar goods made from wool. In the manufacture of such goods, Nos. 14 to 20 twist and Nos. 2 to 8 weft are used. These tissues are very heavy, a piece of unbleached fustian 50 arshines long and 1 arshine wide weighing about half a poud, and also very dear considering the material contained in them.

With a view to reducing the cost in the fabrication of these goods the manufacturers use weft made from all kinds of cheap materials, namely: the waste and droppings which result during the processes of scutching, carding and spinning, and which are of such short and unequal staple, that their further use for spinning into yarns, with the ordinary assortment of cotton spinning machinery, is rendered either unprofitable or quite impossible. With the adoption of an assortment of machinery, the same as is used for shoddy, for the working up of this raw material, it is possible to produce a cheap waste yarn quite suitable for weft, for fustians and buckskins, but especially for fustians. As this texture passes through a process of raising, a better nap is formed when weft is used prepared in the before-mentioned manner. Thus, the fabrication of heavy printed goods caused a special manufacture of weft yarn from waste, in the making of which large manufactories, as well as special waste-spinning mills, are occupied. This industry spread so rapidly soon after its appearance, that there was an insufficiency in the amount of cotton waste, which at first was supplied solely by local cotton spinning mills. This waste, consisting of willow, clearer, roller, doffer and cylinder strips, was then imported from England, where it is of little value. With the tariff of 1891 the importation of cotton waste was made very difficult, and this circumstance compelled the manufacturers to use low classes of cotton mixed with the waste from local cotton mills for the production of waste yarn.

With the cotton-spinning industry should be coupled the manufacture of vigone yarns, which are made from a mixture of dyed cotton, most frequently black and brown, and wool, in which mixture the amount of wool varies from 2 to 10 per cent. The cheaper kinds are made from a mixture of dyed and undyed cotton, or in place of the latter, bleached flax waste is substituted. The manufacture of vigone yarns was first commenced in Verdan and Crimnitzschau in Saxony, whence it was brought into Russia in 1879, when at the close of the Turkish war several of the Saxon manufacturers transferred the new industry to the Polish manufacturing regions. Vigone yarns are made on exactly the same class of spinning machines as those used in the manufacture of woollen yarns. As regards the construction and size of vigone mills, they are in every respect the same as those for woollen manufacture and are of no considerable dimensions. Taking these facts into consideration it was an easy matter during the depression in the woollen trade for several manufacturers to convert their mills into those for the spinning of vigone yarns.

#### COST OF PRODUCTION OF COTTON MANUFACTURES.

The cost of production of cotton yarns of medium numbers in Russia is from 9 to 12 kepecks per count per poud, so that the cost of production of one poud of



twist yarn, № 32, is from  $32 \times 9$  kopecks to  $32 \times 12$  kopecks, that is, from 2.88 to 3.84 roubles; these costs are taken from the yearly balance sheets. To show the different items forming the cost of production, statistics are given, which are more or less adapted to the large cotton spinneries, reckoning per pound of yarn:

|  | Moscow district. | Petersburg district. |
|--|------------------|----------------------|
|  | Counts of yarn.  |                      |
|  | 25               | 24                   |
| Fuel, per pound of yarn . . . . .  | 90 kopecks       | 53 kopecks           |
| Wages . . . . .  | 75 »             | 81 »                 |
| Oiling . . . . .   | 2.5 »            | 8 »                  |
| Lighting . . . . .   | 3 »              | 5 »                  |
| Card clothing, banding, strapping, roller skins, bobbins                             | 22 »             | 21 »                 |
| Re-mount of machinery, including materials . . . .                                   | 25 »             | 23 »                 |
| Administration . . . . .   | 10 »             | 57 »                 |
| Re-mount, mill buildings, barracks, hospitals, schools and Government taxes. . . . . | 50 »             |                      |
| Total . . . . .  | 2.775 roubles    | 2.48 roubles         |

That is, per count per pound about 10 to 11 kopecks would be the cost.

In the Polish districts the cost of production for medium counts, № 26, is about 10.5 kopecks per count per pound, in which the principal items are 38 kopecks for fuel and 1.08 roubles for wages. In comparing the foregoing statistics it will be seen that although the various items differ in the cost of producing yarn, still the totals in the three manufacturing districts are nearly the same. The principal difference lies in the price of labour and cost of fuel. The Polish district has the advantage in respect to the cost of fuel, having rich coal mines in the Petrokovsk government. The Petersburg district is not so advantageously situated, having to use coal imported from England, and the Moscow district, where turf, wood, naphtha and coals are principally used, labours under still greater disadvantages. According to official statistics given in 1889 the consumption of fuel in the cotton spinning manufactories in the Moscow and Vladimir governments, if the caloric co-efficiencies be taken into consideration, was, wood, 24.25 per cent; turf, 38 per cent; coal, 8.5 per cent, and naphtha residues, 29.25 per cent. The price of wood in the Moscow government increases yearly and varies from 11.6 to 13.1 kopecks per pound; turf, the use of which is rapidly increasing in the mills in the vicinity of Moscow and which has now reached an annual consumption of more than 100,000 cubic fathoms, owing to the high rate of transit costs as much as 12 and even 16 kopecks per pound, pressed and dried. Manufacturers here expend large sums of money, which may be considered as so much dead capital, in acquiring forests and in buying or renting bogs. Moreover, wood and turf are transported cheaply and conveniently only during the winter months, consequently manufacturers are compelled to lay in supplies of this fuel sufficient to last them a considerable time, as is not the case in the Polish district where coal is obtainable during the whole of the year.

With regard to the price of labour it is highest in the Polish and lowest in the Moscow districts, as will be seen by the following particulars regarding the weekly wages of workmen in the different departments of cotton manufactories.

| WORKMEN.                 | Moscow district. | Polish district. |      |
|--------------------------|------------------|------------------|------|
|                          | R O U B L E S .  |                  |      |
| Mixing room . . . . .    | 1.75 to 3.00     | 3.00 to 4.00     |      |
| Scutching room . . . . . | 1.75 3.00        | 3 80             | 4.80 |
| Card > . . . . .         | 1.75 2.50        | 4.00             | 5.00 |
| Spinners > . . . . .     | 4.00 7.50        | 8.50             | 9.00 |
| Piecers > . . . . .      | 2.75 3.50        | 2.80             | 3.50 |
| Creelers > . . . . .     | 1.80 2.75        | 2.00             | 3.00 |
| Reelers > . . . . .      | 1.30 3.75        | 3.40             | 4.00 |
| Packers > . . . . .      | — —              | 2.50             | 3.00 |
| Weavers > . . . . .      | 2.00 3.80        | 4.00             | 7.00 |

The cost of production of cotton tissues in general use, including depreciation and sinking of capital, is as follows :

| NAMES OF GOODS.        | Width in arshines. | Number of arshines per pond. | COUNTS OF YARN. |                 | VALUE PER POUND OF GOODS. |             |        | Price per arshine. |
|------------------------|--------------------|------------------------------|-----------------|-----------------|---------------------------|-------------|--------|--------------------|
|                        |                    |                              | Number of warp. | Number of weft. | Yarn.                     | Production. | Total. |                    |
| R O U B L E S .        |                    |                              |                 |                 |                           |             |        |                    |
| Calico . . . . .       | 4/4                | 290                          | 32              | 34              | 16.50                     | 4.35*       | 20.85  | 7.3                |
| > . . . . .            | 5/4                | 264                          | 32              | 36              | 16.50                     | 4.50        | 21.00  | 7.9                |
| > . . . . .            | 4/4                | 400                          | 32              | 38              | 16.80                     | 5.20        | 22.00  | 5.5                |
| Cashmere . . . . .     | 4/4                | 238                          | 26              | 12              | 13.20                     | 2.40        | 15.60  | 6.7                |
| > . . . . .            | 5/4                | 132                          | 26              | 8               | 12.80                     | 2.40        | 15.20  | 11.5               |
| Etoile du nord.        | 4/4                | 304                          | 32              | 32              | 17.80                     | 5.20        | 23.00  | 7.6                |
| Fancy . . . . .        | 4/4                | 268                          | 36              | 32              | 17.30                     | 8.00        | 25.30  | 9.4                |
| Brilliantine . . . . . | 4/4                | 296                          | 32              | 36              | 18.00                     | 8.00        | 26.00  | 9.0                |
| Domestic . . . . .     | 4/4                | 216                          | 26              | 14              | 14.05                     | 2.70        | 16.75  | 7.7                |
| Cord . . . . .         | 4/4                | 184                          | 32              | 18              | 15.60                     | 3.70        | 19.30  | 10.5               |
| Diagonal . . . . .     | 4/4                | 184                          | 26              | 18              | 15.30                     | 3.70        | 19.00  | 10.3               |
| Fustian . . . . .      | 4/4                | 140                          | 26              | 8               | 15.10                     | 2.40        | 17.50  | 12.5               |

\* The average cost of production per piece (90 arshines) of 8 pound calico (that is, a piece weighing eight pounds), consists of the following items: weavers wages, 30 kopecks; other wages, 13 kopecks; administration, 5 kopecks; materials, 10 kopecks; general expenses, 30 to 35 kopecks; total, 90 to 95 kopecks.

To be able to estimate the cost of bleached, dyed and printed goods, the cost of bleaching, dyeing and printing must be added to the price of the goods in the raw state, and the loss of weight and waste during the above-named processes must be taken into consideration. The cost of bleaching, dyeing and printing cotton goods of medium quality in general use is shown in the following figures. In all the under-mentioned calculations a piece of calico is taken, 14 vershocks wide (24.4 inches) of 850 dents to the reed, 60 arshines long and 7 pounds in weight. Bleaching costs from 18 to 25 kopecks per piece.

The cost of dyeing in different colours depends upon the class of dyes used, reckoning per arshine of tissue: dark indigo, about 5 to 6 kopecks; medium indigo, 2.75 kopecks; light indigo, 2 kopecks; smooth red alizarine, 3 kopecks; smooth cardinal alizarine, 2.5 kopecks; bordeaux or garnet alizarine, 2.5 kopecks; bistre, dark shade, 1.7 kopecks; aniline black corrodent, 2 kopecks; red congo and benzo-pourpourine, 2 kopecks; naphthol of different shades and colours, 1.5 kopecks; garnet or bordeaux, dyed with fuchsin, grenadine, or Bismack, 2.5 kopecks; lilac and violet, 2.75 kopecks; azure and dark blue, 2 to 2.75 kopecks; green, 2.25 kopecks. For printed goods it is difficult to give any general or average figures as the fluctuation in the cost of manufacture is very great and depends, firstly, on the amount of printing colours used, which in turn depends on the character of the design and the depth to which the printing rollers are engraved; secondly, on the price of the colours used; thirdly, on the number of times the printed matter passes through the machine, and the number of different processes it undergoes before it reaches a finished state. It can be stated, but approximately, that the cost of printing at the majority of Russian print works is from 1.75 to 6 kopecks per arshine, and for the more predominant kinds, from 2.5 to 3 kopecks per arshine.

#### PRICES OF COTTON AND COTTON MANUFACTURES.

In order to explain the commercial side of the Russian cotton manufacturing industry, the commercial value of raw cotton and cotton goods is given below.

##### PRICES OF RAW COTTON.

| Years.     | Price in England * in roubles gold per pound. | Average exchange. | Price in Moscow ** in roubles gold per pound. | Difference in price between England and Moscow. |
|------------|---|-------------------|---|---|
| 1884 . . . | 5.81  | 1.58              | 6.83  | 1.02  |
| 1885 . . . | 5.51  | 1.61              | 6.36  | 0.86  |
| 1886 . . . | 4.84  | 1.65              | 5.89  | 1.05  |
| 1887 . . . | 5.16  | 1.81              | 6.18  | 1.02  |
| 1888 . . . | 5.29  | 1.72              | 6.96  | 1.67  |
| 1889 . . . | 5.65  | 1.50              | 7.51  | 1.86  |
| 1890 . . . | 5.96  | 1.40              | 7.70  | 1.74  |

\* Middling Upland cotton.

\*\* Average prices of classes of American cotton, quoted on the Moscow exchange.

Annual average prices for cotton yarns and calicos in Moscow, from quotations on the Moscow exchange.

| Years.                   | Nos <sup>32</sup> / <sub>32</sub><br>weft per<br>poud. | Nos <sup>32</sup> / <sub>40</sub><br>weft per<br>poud. | Nos 34<br>twist per<br>poud. | Calico 20<br>vershoks<br>per arshine. | Calico 15<br>vershoks<br>per arshine. |
|--------------------------|--|--|------------------------------|---------------------------------------|---------------------------------------|
| P A P E R R O U B L E S. |  |  |                              |                                       |                                       |
| 1877 . . .               | —  | 15.99  | 16.50                        | 0.0775                                | 0.07                                  |
| 1878 . . .               | —  | 19.82  | 21.52                        | 0.10                                  | 0.085                                 |
| 1879 . . .               | —  | 21.13  | 21.14                        | 0.11                                  | 0.105                                 |
| 1880 . . .               | —  | 19.63  | 20.49                        | 0.1225                                | 0.075                                 |
| 1881 . . .               | 19.06  | 18.90  | 18.94                        | 0.1175                                | 0.0775                                |
| 1882 . . .               | 18.26  | 18.82  | 19.02                        | —                                     | 0.0675                                |
| 1883 . . .               | 15.87  | 16.16  | 16.53                        | —                                     | 0.055                                 |
| 1884 . . .               | 15.48  | 15.93  | 16.28                        | 0.095                                 | 0.055                                 |
| 1885 . . .               | 15.81  | 16.45  | 16.41                        | 0.09                                  | 0.0625                                |
| 1886 . . .               | 15.99  | 16.66  | 16.50                        | 0.0925                                | 0.0575                                |
| 1887 . . .               | 18.48  | 18.96  | 19.65                        | 0.1125                                | 0.0725                                |
| 1888 . . .               | 20.11  | 20.99  | 21.17                        | 0.11                                  | 0.0675                                |
| 1889 . . .               | 17.07  | 17.54  | 17.78                        | 0.09                                  | 0.06                                  |
| 1890 . . .               | 16.14  | 16.65  | 16.82                        | 0.09                                  | 0.0575                                |

The Russian cotton manufacturing industry benefits by a large customs tariff, levied to protect it from foreign competition. It is possible that this protection has caused consumers to make sacrifices to the Russian manufacturers, but these sacrifices are doubtless recompensed by a visible gain to the native industries. Cotton manufactured goods are articles, supplying not a whim, fashion or luxury but an actual necessity, and the fabrication of them gives large earnings to the inhabitants, as in the cost of production wages occupy the first place. Considering that each workman earns annually about 200 roubles, it may be seen that the amount of wages paid yearly by cotton manufacturers to 211,000 workmen amounts to about 40,000,000 roubles. Besides supplying the people with work the trouble taken by the Government to develop home manufacture is amply rewarded, as may be seen by simple calculations. The requirements in raw cotton, as before stated, may be reckoned at 11,500,000 pouds; out of this amount 8,000,000 pouds are imported over the European frontiers, to the value of 80,000,000 roubles, which sum forms approximately 22.5 per cent of the total value of the imports. But this considerable sum appears small when compared with what would be paid by the country to foreign manufacturers if, instead of raw material, finished goods were imported. In reality, if it is granted that 11.5 million pouds of cotton consumed by the Russian manufactories would approximately give 10,000,000 pouds of finished goods, further allowing

that if instead of Russian goods consumers should be supplied by those of English make at the lowest possible rate of 25 roubles per pound, then the amount of Russian money sent abroad would be 250,000,000 roubles, exceeding two and a half times the amount paid to foreigners for raw cotton. The influence of increased imports would materially affect the exchange, as will be seen by statistics given in the Introduction to this book. Moreover, the development of the cotton manufacturing industry in Russia has created a special branch of production, namely, the cultivation of cotton, with a view to obtaining the necessary material for spinning, and this branch may be said to have a splendid prospect in the future.

In Turkestan at the present time there are 375,000 dessiatines of land prepared, which are quite suitable for the planting of cotton, and capable of producing 7,000,000 pounds of fibre in the clean state. Thus in the near future probably the greater part of the Russian cotton industry will be supplied with native raw material. Consequently the protective tariff on cotton goods has undoubtedly produced visible fruits. Taking into consideration that the Russian cotton manufacturing industry grows with such amazing rapidity, and at the same time improves in the quality of its production, one must naturally suppose that in time, and probably at no very distant date, this industry will become so firmly rooted that with the smallest protective duty it will be able to freely withstand foreign rivalry.


The competition with England forms a subject for serious consideration to Russia, as well as to the majority of European countries. As regards the extent of the development of the cotton manufacturing industry, England unquestionably occupies the first place among other nations, as she possesses more than half the total number of spindles in the world, and notwithstanding the perfection at which she has arrived in the construction of machinery further improvements are constantly made, as may be seen for instance in the improvements in carding engines and ring frames, made since the Manchester Exhibition of 1887, the spindles of which move at the tremendous speed of 11,000 to 12,000 revolutions per minute. Thus spinning in England from a technical point of view has the advantage of richer surroundings than any other country on the continent of Europe. Besides this. English cotton manufactories serve as model schools, organized by a body of experienced masters and workmen for producing new kinds of goods. The cheapness of raw cotton, the abundance of splendid and cheap coal and cast iron, the possession of one of the first cotton markets, Liverpool, all these combined factors form the ruling stability of the English cotton industry.

One of the essential causes which may retard the development of cotton manufacture in Russia is the insufficiency of works for the construction of cotton spinning machinery. This inadequacy compels Russia to use machinery of English make (Platt Brothers, Howard and Bullough, Dobson and Barlow, Curtis and Sons, Samuel Brooks, Hetherington, Crighton, Asa Lees and others) and this circumstance presents great difficulties to the Russian spinner. The construction of machinery was first commenced in England, and up to the present, that country has retained the priority. She not only fully supplies her enormous home wants, having about 44,000,000 spindles at work, but furnishes with her product the whole of the continent of Europe.

The preparation of cotton spinning machinery belongs to a class of industry which requires for its foundation an immense amount of capital. It is palpable that

with the 6,000,000 spindles existing in Russia, it would be difficult to expect any considerable home demand for spinning machinery, at the present time, and consequently it is not to be supposed that any special works can be established for its construction. Machinery of Russian make would be very expensive at first, and the industry itself would require a considerable protective tariff to defend it from English competition, which of course would make the further development of cotton spinning very difficult. Nevertheless the fact that at the present time Russian works engaged in the construction of looms and preparatory weaving machinery have gained a firm footing, shows that little by little there will be sufficient employment found in Russia for similar works for the construction of spinning machinery, which in time will form an independent industry. The initiators of this work should be the owners of cotton spinning mills, as persons mostly interested in the progress of spinning.

By reducing the price of machinery it would be possible to obtain a cheaper product of an improved quality. The erection of a cotton spinning mill of 40,000 spindles in England costs from 12 to 15 roubles paper per spindle, whereas in Russia the erection of a similar mill would cost double that amount, namely 25 to 30 roubles per spindle. In this manner the depreciation in machinery falls considerably heavier per pound of yarn in Russia than in England, but any attempt to reduce this cost is in the highest degree injurious to the industry. Thus in order to increase the yearly production per spindle, and to distribute the cost of depreciation per spindle over a larger amount of yarn, cotton manufacturers are obliged to have recourse to night as well as day work. Night work is in the highest degree unsatisfactory in respect to quality of production and presents great difficulties to the workmen, as well as to the manufacturer. If besides this it be taken into consideration that cotton spinning machinery is being constantly improved, and that machines made ten or fifteen years ago are 10 per cent less productive than at the present time, the nature of the advantages possessed by English cotton spinning manufactories is easily understood, especially when it is remembered that they have first class works for the construction of machinery. The expense of spinning machinery is one of the chief drawbacks to the successful development of the spinning of fine counts. Owing to the small amount of fine yarn that can be produced the cost of depreciation on such yarn falls very heavily. Naturally the more a machine produces the more area there is over which to distribute the costs; consequently, the manufacture of medium counts of yarn in Russia is essential, particularly as the principal demand is for these numbers.



## CHAPTER II.

## Flax, Hemp and Jute Goods.

**T**HE production of goods made from bast fibrous materials occupies the second place among the branches of Russian manufactures, that of cotton textile fabrics ranking first. This appears at first sight very strange, and it would seem, on the contrary, that the linen goods industry ought to be the more profitable branch of manufacture, as Russia possesses vast supplies of cheap linen fibre sufficient to export 10 to 11 million pounds per annum, over and above its own requirements; while in order to carry on the manufacture of cotton textile fabrics it is necessary to import as much as 9 million pounds of raw material. This apparent inconformity is, however, explained notwithstanding the fact that flax goods have many advantages over cotton in consequence of which they are in many cases deserving of preference. Flax, for instance, is much stronger than cotton on account of the straightness of its elementary fibres, gives a smoother yarn and textile fabric, and therefore flax stuffs are not so rough as cotton and are more useful in certain cases; but on the other hand it is so much cheaper to weave cotton goods that they are considerably cheaper than flax fabrics. In order to be thoroughly convinced of the correctness of the foregoing statements it is only necessary to compare the cost of making yarn of the same fineness from both flax and cotton. One pound of flax yarn, Nos. 50 to 70, costs in material, (that is, combed flax) from 12.50 to 17.50 roubles, and the cost of spinning is 9 to 12.60 roubles, making in all 21.50 to 30.10 roubles, whilst a pound of cotton yarn of the same degree of fineness, that is, Nos. 18 to 25, notwithstanding that the price of raw cotton is from 2.5 to 3 times dearer, costs in material from 9.80 to 13.60 roubles, and the spinning from 2.20 to 3 roubles, making from 12 to 16.60 roubles in all. Thus, for yarn of medium fineness cotton is 55 per cent the cheaper, and for the higher numbers this difference is still more considerable. If, therefore, the manufacture of flax goods in Russia does not seem to be so developed as the manufacture of cotton goods, it is for the most part due to the smaller demand for the former class of stuffs, which are beyond the reach of the majority of the population.

The importance of this branch of manufacture and the necessity for its further development in Russia is also shown by the universal demand for enormous quantities of Russian raw material, instead of which it would naturally be much more preferable to export manufactured goods.

The manufacture of flax and hempen goods, as a branch of industry, is deserving of particular attention partly because it is a part of that primitive kind of Russian trade which is still to a great extent carried on by separate households in the cottages. The peasants of those provinces where flax and hemp are cultivated retain part of their crop for their own special requirements; they spin the yarn themselves, weave the cloth upon looms of the simplest construction, and make durable linen. In some districts they find it possible to do without almost any cotton stuffs and only use them in small quantities on account of their attractive colours and finish. This industry may, therefore, be rightly termed a popular one.

### HISTORICAL SKETCH OF THE FLAX AND HEMP INDUSTRIES.

The manufacture of flax and hemp goods has for a long time occupied a very prominent place among the native industries. The ancient chronicles referring to the tenth and eleventh centuries already mention that cloth of various kinds was made from flax and hemp. These textile fabrics were not only sold in the country, but were also sent abroad, forming an important item in the export trade of Novgorod and Pskov. In the treaty charters between the inhabitants of Novgorod and the princes in the thirteenth and fourteenth centuries the flax trade is particularly mentioned, and a special duty was levied on each bale of hemp.

When the trade route through the White Sea was discovered by the English in the sixteenth century they founded the first flax spinning works at Kholmogory and also two factories for rope-making, one at Kholmogory and the other at Vologda, as this trade had up to that time been but little developed. At the end of the seventeenth century the direction of the export trade was again changed, and Riga, Reval and Dorpat became the chief points, and Germany the principal consumer. Although Russian cloth and linen, as well as carded flax, stripped hemp and ropes, found a ready sale abroad, still these textile fabrics were of a coarser kind and the Russian gentry of that period used to order their linen abroad.

The Government had endeavoured at a still earlier period to take the flax trade under its exclusive jurisdiction, but it was only during the reign of Peter the Great that it met with the energetic intervention of the authorities, who regulated the industry itself and introduced measures for its improvement and development. Among other things an order was issued to manufacture only wide linen and to use special contrivances for making it. Furthermore, in order to facilitate the extension of linen factories Peter the Great granted all possible privileges and exemptions to the first manufacturers, such as free grants of land and buildings, special privileges in law and service, and also forbid the import of foreign linen. The first linen factories were established in the district of Moscow and the province of Yaroslav, where spinning had for a long time been the staple trade of the inhabitants.



The formation of the fleet was the means of establishing sailcloth factories in the province of Kalouga, and greatly tended to the development of the rope-making industry. Both of these latter branches of trade were under the special control of the Admiralty. Besides this, measures were taken to regulate the hemp trade and it was directed to foster it in the same way as that of flax. The same practice was adhered to in the subsequent reigns, and in addition to this, as in the time of Peter the Great, the Government preferred handing over the working of the Government factories to private firms.

Although the number of mills increased from 54 to 70 between 1761 and 1776, and although the Government showed continual solicitude, still the quality of the linen goods manufactured during the last century was not by any means all that could be desired, and even during the latter half of the last century the linen was sent abroad to be bleached. The export of textile fabrics, however, increased gradually, and in proportion to the export of flax fibre and tow, thus in 1758 to 1760, 66,000 pieces of sailcloth, flemish linen and raven's duck were exported, and other kinds to the value of 395,000 roubles; in 1790 to 1792 the export rose to 179,000 pieces of sailcloth, flemish linen and raven's duck, and 596,000 roubles worth of other kinds. The number of ropewalks was for a long time very limited and only began to increase rapidly during the reign of Catherine II, when there were 60 in all, the original number being 25, and the export between the periods of 1758 to 1760, and 1790 to 1792 rose from 24,000 to 104,000 pouds.

At the beginning of the present century there was a greatly increased demand for linen for the army, and this had a favourable influence upon the development of the linen trade. From 1804 to 1809 the output of the mills increased from 12,369,600 arshines with 23,711 hands, to 22,375,800 arshines with 36,500 hands. Besides satisfying the increased demands for home consumption a considerable quantity was exported.

Putting aside the first small ventures in flax spinning by machinery, the oldest, and at the same time one of the best Russian mills, is the Girardovsk factory, which was established in 1830, built according to the plans of the inventor of flax-spinning machinery, Philip de Girard, at the expense of the Charles Scholtz Joint Stock Co., in Marimont near Warsaw, whence it was removed during the Polish insurrection to its present place at Girardo. Although this mill was under the management of Philip de Girard it did not work satisfactorily when first started, owing to a series of unfavourable circumstances; the machines, for instance, which were all constructed in this country, as it was at that time forbidden to import English flax-spinning machinery, did not quite answer the purpose; there was also not much demand for finespun yarn and the cost of spinning it was high. About this time also the linen industry in England had reached a very high degree of efficiency, and was holding the monopoly of making flax-spinning machinery, and having had recourse to protective tariff, was arduously engaged in perfecting the industry. Besides the fine textile fabrics the manufacture of the coarser kinds also greatly increased there, and little by little the English goods, followed by the German, began to supplant Russian manufactures on the foreign market. The brilliant success achieved by the cotton trade was added to this, and cotton goods rapidly found favour with the Russian people, completely replacing the linen fabrics which had been up to that

time exclusively used. The results of all these unfavourable conditions for the linen trade were, an increased export of flax fibre, which attained 50 per cent between 1840 and 1850, and a gradual decrease in the amount of manufactured goods.

The attention of the Government was drawn to the difficult situation of the linen trade, and from 1837 to 1853, a great many measures were taken for relieving it. Thus in 1837, model flax cultivation was established; in 1845 all those who were desirous of studying flax spinning and weaving by machinery were allowed free access to the Alexandrovsk mill. Finally, in 1844 to 1846 a special commission investigated the condition of the linen trade in Russian and abroad, which resulted in more attention being given in the agricultural schools to the teaching of more rational methods of cultivating and of dressing flax, in providing the peasants with metal strickles for carding, spinning wheels and metal reeds, and various kinds of rewards were promised to the first organizers of flax spinneries and factories for making high class linen goods. These measures, and especially the latter, were the means of starting, soon after 1850, several establishments for weaving, bleaching and dressing linen by machinery; but unfortunately the customhouse duties were changed in 1850, and the duty on all linen goods considerably lowered; this brought an enormous influx of foreign goods into the market, attaining the value of 1,000,904 roubles in 1851 to 1853, so that the new mill owners found themselves in a very critical situation, which in many cases ended in complete liquidation.

The hemp-spinning and rope-making industries did not cease to increase during the first half of the present century, although they were subjected to certain variations, so that instead of the sixty factories with an output of 252,000 pounds of rope and yarn in 1804, there were already in 1850 as many as 160, producing 1,177,000 pounds. The export of hempen goods also increased proportionately: thus, from 1824 to 1828 and from 1851 to 1853 the mean yearly export rose from 257,000 to 448,000 pounds.

Owing to the increased consumption of linen for the army during the Crimean war business was not only brisker for those mills which had survived the crisis, but several other flax spinning works were started, first in the province of Kostroma and then in other districts. These new mills prospered well at first, especially as the price of the raw material had fallen to 1.30 roubles per pound. After the termination of the war, however, it became difficult to find a market for the yarn and the large consumption of flax fibre had so raised the price of the raw material during the winter of 1861 and 1862, to 4.50 roubles per pound, that the position of flax spinners thus again experienced a change for the worse. Obligated to find a sale of some sort for their goods the manufacturers began to supply the peasants with yarn on credit. This circumstance had also an important bearing upon the development of the linen trade amongst the cottagers of the provinces of Kostroma and Yaroslav; they entirely gave up hand spinning and took to weaving, bleaching and dressing linen. The cotton crisis, which occurred soon after 1860, not only released the Russian factories from their inaction but was even the means of establishing new flax spinning works.

In general, during the twenty-five years succeeding the Crimean war, the development of the flax-spinning trade far surpassed that of linen. In 1856

the value of both these branches was 2,871,000 roubles, out of which about 500,000 roubles represent the share of the flax spinning; whilst in 1879 it rose to 13,100,000 roubles, and the linen industry only increased to 11,230,000 roubles, that is to say, that flax-spinning by machinery preponderates. This is due to the fact that, besides the linen factories, the village weavers after 1860 also adopted machine-made yarn. In any case the figures which have been quoted show that the development of the linen manufacture for the given period was by no means inconsiderable. In 1856 large linen factories, producing 300 thousand to 500 thousand roubles worth of goods, were exceptional; in 1879 there were several which turned out more than a million roubles worth. However, as the production increased the total number of mills decreased, the large factories supplanting the smaller ones.

The Russian linen goods also greatly improved in quality, as shown by the Industrial Exhibition of 1870, although most of the mills manufactured the lowest and medium numbers of yarn, up to № 40, yet many spun Nos. 50 to 80, and two mills even made № 160, namely those of Gribanov and Hill & Ditrich. Besides this, it was shown that considerable progress had been made in dressing linen and chlorine bleaching was widely diffused. These improvements were important, because after the Crimean war a new kind of sackcloth and packing cloth, manufactured from jute, made its appearance on the foreign markets, and due to its cheapness soon took the place of the linen and hempen goods previously used for that purpose, so that the demand for the rough kinds of linen and hempen cloth still further decreased.

By examining the exports of hempen yarn, ropes and string from 1855 to 1888, as representing the most reliable data for judging the degree of development of the hemp trade during that space of time, it may be concluded that the export of hempen goods increased all the time up to 1870, but thereafter began to fall off, but only as regards the export of rope, as that of hempen yarn continued to increase.

This historical sketch terminates prior to 1880 and the condition of the trade in flax, hemp and jute goods during the last fifteen years may now be investigated.

#### THE QUANTITY OF MATERIAL USED AND ITS PROPERTIES.

The flax crop of the Russian Empire is on the average 17,500,000 pounds; during a good harvest, it reaches 20 million and during a bad harvest declines to 15 million pounds, that is, about 56 per cent of the total amount cultivated on the earth's surface. After subtracting from this the quantity sent abroad, which from 1887 to 1891 averaged about 10,900,000 pounds per annum, the amount used within the limits of the Russian Empire will be found to be 6,600,000 pounds, of which about 1,800,000 pounds go to the spinning works, the remainder being used by the village workmen, although at present the latter prefer to make linen from machine-spun yarn.

The quantity of hemp produced in European Russia may be taken as 8,500,000 pounds, or about 40 per cent of the whole amount gathered in Europe. Subtracting the quan-

tity sent abroad, which between 1887 and 1891 averaged about 3,600,000 pounds per annum, the amount used in Russia is therefore 4,900,000 pounds, of which about 2,500,000 pounds are consumed by various factories and mills, the remainder being used in the numerous hemp-stripping establishments, or else in the village industries.

The superior qualities of the Russian flax, which is successfully cultivated over a wide area of the Russian Empire, enable it to furnish most excellent fibre, quite capable of being spun into fine yarn, as was confirmed by the work of Gribanov, and Hill & Dietrich, where before 1870 they used already in some cases to spin № 160. It may be mentioned that the numbers of flax yarn are determined by the number of skeins in a pound (36 pounds) divided by three, the length of a skein being 3,600 yards. In Russia, unfortunately the work of flax culture is not subdivided in the same way as abroad, and the peasants who are the principal cultivators, as land-owners sow comparatively little flax, have also to do all the work of parting the fibre from the stalk. If then these peasant flax farmers, on account of their small store of agricultural knowledge, experience great difficulty in forsaking the primitive methods of flax culture, it is still more difficult for them to improve in any way their old-fashioned means of flax dressing, which is a separate occupation from their ordinary agricultural duties. Thus the most usual way of dampening the flax, by allowing it to lie in the dew, or by spreading it about the fields, is less rational than steeping it in water; this spreading is also generally done in cold, unfavourable autumn weather; and the breaking and stripping are very often effected with very inefficient appliances, after which it is found necessary to powerfully dry the flax straw in kilns, undoubtedly injuring the quality of the fibre.

The unsatisfactory nature of the flax dressing and sorting has drawn upon itself the attention of the Agricultural and Farming Department, and experienced instructors were first prepared and then a whole series of measures were pointed out for placing the flax trade on a more rational footing. One of the most important of these was the establishment of the first flax station as a practical school for flax culture. Notwithstanding the short career of these first instructors, the successful manner in which they applied new and improved methods not only again drew public attention towards this deeply rooted branch of Russian farming, but had also the practical result of leading to the establishment of large flax farms. These first experiments proved that by improving the method of treating flax straw alone, the value of the fibre rose 50 per cent, and at the same time increased the output by 75 per cent. The quality of the fibre was so good that it was used for spinning yarn of those numbers which had previously been made of Belgian flax. and it was sold at 10 to 11 roubles per pound. These results are good omens for the further success of the Russian flax trade.

Although there is a great difference in the fibre of the various kinds of Russian flax in the market, they may yet be divided into two distinct groups: *steeped flax*, being those kinds which are prepared by soaking in water, the fibre being much stronger, longer and more uniform; *spread flax*, which is moistened only with dew and is known by its softness and greasiness. Each of these two groups may be divided into three classes according to the quantity of combed flax and combings obtained and also as regards their spinning properties:

| DENOMINATION.        | Combed flax.     |         | Combings.        |         | Loss per cent. |
|----------------------|------------------|---------|------------------|---------|----------------|
|                      | Useful per cent. | Mean №. | Useful per cent. | Mean №. |                |
| <b>Steeped flax:</b> |                  |         |                  |         |                |
| 1st class . . . . .  | 50               | 50      | 45               | 25      | 5              |
| 2nd class . . . . .  | 42               | 40      | 53               | 20      | 6              |
| 3rd class . . . . .  | 35               | 35      | 59               | 18      | 6              |
| <b>Spread flax:</b>  |                  |         |                  |         |                |
| 1st class . . . . .  | 40               | 35      | 54               | 18      | 6              |
| 2nd class . . . . .  | 25               | 30      | 68               | 14      | 7              |
| 3rd class . . . . .  | 18               | 20      | 75               | 10      | 8              |

The best known steeped flax comes from the government of Pskov; it really belongs to the 2nd class, but then the quantity of the 1st class steeped flax is in general very small. The best qualities of spread flax come from Vologda and are used for spinning Nos. 140 to 160 yarn. These high class qualities are for the most part used in the Russian factories. On the average the Pskov flax yields after combing 42 per cent suitable for spinning Nos. 30 to 50 yarn, and 52 per cent of combings for Nos. 10 to 18; the Vologda flax yields 46 per cent of combed flax suitable for Nos. 50 to 80, and 50 per cent of combings for Nos. 14 to 24.

Besides stripped flax a considerable quantity of tow is made by intentionally working flax into combings by means of very primitive kinds of hackles. The Siberian and Crimean tow are the most highly prized and are often not inferior to good quality stripped flax. In 1889 the price of all kinds of tow was only 10 per cent below that of stripped flax. The best kind of hemp for spinning yarn comes from the government of Smolensk; it is remarkable for its fineness, strength and silkiness of fibre; the most suitable for rope-making comes from the government of Orlov.

#### THE IMPORT OF FOREIGN GOODS INTO RUSSIA.

The import of yarn, rope and other cordage from 1877 to 1891 is given in the following table:

| YEARS.                           | Y a r n. |           | Rope, string, nets. |           |
|----------------------------------|----------|-----------|---------------------|-----------|
|                                  | Pou ds.  | Rou bles. | Pou ds.             | Rou bles. |
| POU DS AND ROUBLES IN THOUSANDS. |          |           |                     |           |
| 1877 . . . . .                   | 10       | 351       | 31                  | 201       |
| 1878 . . . . .                   | 16       | 436       | 79                  | 556       |
| 1879 . . . . .                   | 16       | 499       | 83                  | 463       |
| 1880 . . . . .                   | 17       | 434       | 26                  | 144       |
| 1881 . . . . .                   | 15       | 464       | 20                  | 83        |
| Average . . . . .                | 14.8     | 434.8     | 47.8                | 290.4     |
| 1882 . . . . .                   | —        | —         | 13                  | 88        |
| 1883 . . . . .                   | 8        | 240       | 13                  | 64        |
| 1884 . . . . .                   | 11       | 330       | 17                  | 103       |
| 1885 . . . . .                   | 7.3      | 235       | 15                  | 90        |
| 1886 . . . . .                   | 5.9      | 176       | 10                  | 159       |
| Average. . . . .                 | 8        | 245.2     | 13.6                | 100.8     |
| 1887 . . . . .                   | 8.4      | 241       | 12                  | 77        |
| 1888 . . . . .                   | 7.6      | 245       | 13                  | 84        |
| 1889 . . . . .                   | 3.5      | 97        | 25                  | 139       |
| 1890 . . . . .                   | 4.7      | 118       | 13                  | 77        |
| 1891 . . . . .                   | 4        | 115       | 13                  | 72        |
| Average. . . . .                 | 5.6      | 163.2     | 15.2                | 89.8      |

The import of yarn, as shown in the table, is quite insignificant. The abrupt cessation of the import in 1883 is explained by the classing of sewing thread and fine string under a different head in the customhouse tariff. In any case the import during the last five years is 30 per cent lower than that from 1883 to 1886. At present only high numbers of flax yarn are imported which, owing to the unsuitability of the Russian yarn, are not made at all, or else in very small quantities by the Russian manufacturers. There is no import whatever of hempen or jute yarn. Two kinds of flax yarn are mostly imported, namely good warp from № 90 to № 130, and cheap weft, principally boiled, as after boiling the yarn loses 20 per cent of its weight.

The chief kinds of rope and cordage imported are manilla hemp and New Zealand flax ropes, and cord made of yarn above Nos. 8 to 10, manufactured from Italian or German hemp, and finally, fishing nets to the amount of a few tons. In any case the quantity and value, not only of the last-named goods but of all kinds of cordage, are very insignificant when compared with the home production of 900,000 pounds valued at 5,400,000 roubles from 1887 to 1889. The same conclusion may be arrived at by consulting the following table:

| YEARS.                   | LINEN AND HEMP FABRICS.         |                | JUTE AND LINEN SACKS AND<br>JUTE PACKING CLOTH. |                |
|--------------------------|---------------------------------|----------------|---|----------------|
|                          | Pouids.                         | Roubles.       | Pouids.   | Roubles.       |
|                          | POUDS AND ROUBLES IN THOUSANDS. |                |   |                |
| 1877. . . . .            | 70.4                            | 1,191          | 564   | 3,531          |
| 1878. . . . .            | 140.2                           | 2,327          | 771   | 5,741          |
| 1879. . . . .            | 146.9                           | 2,566          | 711   | 4,277          |
| 1880. . . . .            | 143.0                           | 2,494          | 740   | 4,341          |
| 1881. . . . .            | 101.7                           | 1,756          | 520   | 3,426          |
| <b>Average . . . . .</b> | <b>120.4</b>                    | <b>2,066.8</b> | <b>661.2</b>                                    | <b>4,263.2</b> |
| 1882. . . . .            | —                               | —              | 229   | 1,233          |
| 1883. . . . .            | 14.1                            | 1,065          | 180.8   | 1,466          |
| 1884. . . . .            | 17.3                            | 1,361          | 242.2   | 1,957          |
| 1885. . . . .            | 17.2                            | 1,350          | 323   | 2,430          |
| 1886. . . . .            | 15.1                            | 1,098          | 308.8   | 2,467          |
| <b>Average . . . . .</b> | <b>15.9</b>                     | <b>1,218.5</b> | <b>256.8</b>                                    | <b>1,910.6</b> |
| 1887. . . . .            | 15.8                            | 995            | 151.8   | 892            |
| 1888. . . . .            | 7.0                             | 616            | 168.7   | 783            |
| 1889. . . . .            | 8.3                             | 758            | 117.8   | 583            |
| 1890. . . . .            | 10.0                            | 751            | 56  | 285            |
| 1891. . . . .            | 6.5                             | 701            | 17  | 127            |
| <b>Average . . . . .</b> | <b>9.5</b>                      | <b>762.4</b>   | <b>102.3</b>                                    | <b>534</b>     |

The first paragraph contains very different sorts of textile fabrics, such as linens, batist, table linen, handkerchiefs, towels, stuffs for upholstering, mattresses and carpets, either of flax, hemp and jute, or mixed with cotton, and also dyed, printed and woven in colours, and some knitted and plaited goods. The mean yearly import during the period from 1883 to 1886 was 13.3 per cent of that of the period from 1877 to 1882, and during the next five years it was 58.8 per cent of that from 1882 to 1886. On comparing the mean values another result is obtained, and the corresponding decrease is expressed by the per cents 58.8 and 62.5 respectively. This clearly demonstrates that lately only very high class goods have been imported, which could only have been manufactured at home from imported flax or yarn and from various twilled and flowered stuffs and the like, and sold as fashionable and expensive articles to the wealthier classes of society.

During the second half of the present century coarse jute goods, especially sacks, were much sold on the European markets, and afterwards appeared here. This had the effect of decreasing the demand for the corresponding linen and hempen goods and led to a brisk import of jute sacks and packing cloth; for this reason the gen-

eral import during the period from 1877 to 1881 was very considerable, namely, 61,000 pounds, with a total value of 4,264,000 roubles. In Begetzk, in the government of Tver in 1870, as many as 2,500,000 linen sacks were made, being always in great demand for the wheat trade; in 1879 only 900,000 were turned out, and in 1880 the amount further decreased to 500,000 pieces.

When the customhouse duties were raised in 1881 the quantity of sacks imported began to decrease, although not without some fluctuations: from 1882 to 1886 the import fell to 38.5 per cent of that of the previous five years, and during the next five years still further diminished 40 per cent, so that the mean yearly import during 1887 to 1891 was only 15.5 per cent of that from 1877 to 1881. The value of the import during that decade decreased still more, namely to 12.5 per cent. It must be observed that as the import of jute sacks declined, the export of raw jute began to increase; that is to say, the home production of jute began to develop. From 1887 to 1891 the mean yearly export was 513 thousand pounds. Taking the average waste in manufacturing jute goods as 15 per cent, the average yearly output of the jute factories would be equal to about 436,000 pounds, which is 4.3 times more than the mean yearly import of all the above mentioned goods during the last five years.

Thus the general value of the yearly import through the European frontier of all the goods enumerated from 1888 to 1891 was, on the average, 1,551,000 roubles, which is about 5.5 per cent of the total production of the Russian flax-spinning linen cloth mills, and ropewalks; this was abundantly covered by the export of similar goods from Russia, as may be seen from the following table:

| YEARS.                                 | Yarn.   |        | Textile fabrics. |        | Rope and cord. |        | Various goods. |        |
|--|---------|--------|------------------|--------|----------------|--------|----------------|--------|
|  | Pounds. | Value. | Pounds.          | Value. | Pounds.        | Value. | Pounds.        | Value. |
| POUNDS AND PAPER ROUBLES IN THOUSANDS. |         |        |                  |        |                |        |                |        |
| 1884 . . . .                           | 141     | 1,245  | —                | 530    | 246            | 1,154  | 1.9            | 74     |
| 1885 . . . .                           | 116     | 611    | 37.8             | 418    | 248            | 1,009  | 9.7            | 44     |
| 1886 . . . .                           | 117     | 494    | 35.8             | 461    | 198            | 1,104  | 18.4           | 125    |
| 1887 . . . .                           | 145     | 764    | 35.7             | 474    | 203            | 1,104  | 8.3            | 69     |
| Average. . .                           | 130     | 778    | —                | 470    | 224            | 1,070  | 11.4           | 78     |
| 1888 . . . .                           | 102     | 463    | 46.1             | 706    | 194            | 1,170  | 8.8            | 911    |
| 1889 . . . .                           | 168     | 784    | 49.2             | 915    | 234            | 1,515  | 17.3           | 217    |
| 1890 . . . .                           | 140     | 560    | 24.7             | 397    | 204            | 1,280  | 6.7            | 45     |
| 1891 . . . .                           | 131     | —      | 24.9             | —      | 268            | —      | 11.0           | 64     |
| Average. . .                           | 135     | —      | 36.2             | —      | 225            | —      | 10.9           | 111    |

The Russian export consists almost entirely of hemp yarn, and only a few hundred pounds of flax yarn. Concerning the textile fabrics it is found that the prin-



cial demand is for coarse linen; the export of sailcloth, flemish linen and raven's duck, which about 1830 amounted to nearly 50,000 pounds, has now declined to less than 6,000 pounds. Although the export in all classes of goods has decreased during the last fifteen years, this principally refers to yarn and textile fabrics, which have been thrust out of the foreign markets by the cheaper jute goods; at present the total value of rope and cord exported exceeds a million, and in some years has attained 1,500,000 roubles. At all events during the two periods of four years extending from 1884 to 1891 the mean yearly export was constant in quantity but rather increased in value for the latter years. It may be observed that the Russian export trade with Asia has developed gradually since 1880, and at present linen and hempen goods are exported to that part of the world to the value of 500,000 roubles per annum.

The following figures compiled from the statistics of the Department of Trade and Manufactures show the yearly returns of the flax-spinning and linen trades from 1885 to 1889:

|                  | PAPER ROUBLES IN THOUSANDS. |              |
|------------------|-----------------------------|--------------|
|                  | Flax spinning.              | Linen trade. |
| In 1885. . . . . | 14,567                      | 11,247       |
| » 1886. . . . .  | 13,467                      | 10,848       |
| » 1887. . . . .  | 14,287                      | 12,766       |
| » 1888. . . . .  | 15,164                      | 15,052       |
| » 1889. . . . .  | 14,314                      | 15,613       |
| Average. . . . . | 14,360                      | 13,105       |

A clearer view may be taken by examining the year 1889 in detail. The total amount of yarn manufactured was 1,600,000 pounds; by subtracting from the returns of the year 2,000,000 roubles which represent the textile fabrics, it will be found that with a production of 1,130,000 pounds of yarn at the average price of 11 roubles a pound, the returns of the flax spinning mills was about 17,600,000 roubles. Granting that nine-tenths of the yarn is woven into stuffs and that the cost of the yarn is about three-fourths of that of the textile fabrics, it will be found that the returns for the whole of the linen trade for 1889 was fully 21,100,000 roubles. It must be observed that the figures given by the Department of Trade and Manufactures, and the calculations just mentioned, include the returns of jute production which has of late years averaged 436,000 pounds, worth 8 roubles per pound, making a total of 3,500,000 roubles.

The value of the rope and cord manufacture in Russia during 1880 was 7,000,000 roubles; from 1881 to 1884 it averaged from 6,200,000 to 6,500,000 roubles and from 1885 to 1889 it may be represented by the following figures:

|                   |           |                |
|-------------------|-----------|----------------|
| 1885 . . . . .    | 4,487,000 | paper roubles. |
| 1886 . . . . .    | 3,280,000 | » »            |
| 1887 . . . . .    | 5,049,000 | » »            |
| 1888 . . . . .    | 4,983,000 | » »            |
| 1889 . . . . .    | 5,690,000 | » »            |
| Average . . . . . | 4,698,000 | » »            |

Upon adding the production of the Polish and Siberian mills, which during this period averaged 188,000 pounds, the total production of the rope trade attains 4,886,000 roubles. The table shows that the decrease in 1886 was of a transitory character, and in 1889 the returns again amount to almost 6,000,000 roubles, so that at present they may be taken as 5,000,000 to 5,500,000 roubles.

THE TECHNICAL RESOURCES OF THE TRADE.

According to the statistics of 1889 there are 245,588 flax spindles in Russia, and most factories work night and day. Supposing that half the mills work during the whole twenty-four hours and the other half, twelve hours per diem, and that there are 280 working days during the year, and again that the above-mentioned spindles were working according to the foreign practice, that is, 300 days of ten hours per year, it would be found that under the latter conditions 412,588 spindles would be required to do the same amount of work produced by the Russian plant under its own conditions.

In 1889 there were 7,312 power looms in the Russian factories. Working 300 days of ten hours, 12,284 looms would be required to do the same work, this number exceeding that of Germany, which occupies the third place in this industry in Europe. In the same year there were thirty-one flax spinning mills in Russia in Europe, some of them with sections for weaving; these mills employed 20,278 hands. There were also 74 linen factories with 23,757 hands, making a total of 105 mills employing 44,035 hands. There are numerous ropewalks, sailcloth, sack and hemp-spinning factories, but unfortunately the want of official data renders it impossible to give a detailed account of their number and production. In general there were in 1888 in Russia and Siberia 263 ropewalks and sack factories, producing 1,281,000 pounds of rope and cord and employing 6,460 hands. This, however, does not convey an accurate conception of the Russian hemp industry, as besides the factories, it is to a great extent carried on in the villages where it is almost impossible to collect reliable information.

A comparison between the Russian and foreign trades, with reference to the amount of raw material consumed in manufacture and the technical aspect of each, will be of interest. The following table shows the quantity of hemp fibre produced and required in the first class European countries from 1884 to 1888:

|                          | Crop of fibre.    | Consumption.     |
|--------------------------|-------------------|------------------|
| Russia. . . . .          | 17,500,000 pounds | 6,248,000 pounds |
| Germany. . . . .         | 4,041,000 »       | 5,646,000 »      |
| Austro-Hungary . . . . . | 2,773,000 »       | 4,175,000 »      |
| France. . . . .          | 2,225,000 »       | 5,790,000 »      |
| Great Britain . . . . .  | 1,312,000 »       | 5,961,000 »      |
| Belgium . . . . .        | 1,202,000 »       | 2,057,000 »      |
| Italy . . . . .          | 1,095,000 »       | 1,091,000 »      |

Thus Russia consumes slightly more than one-third of its total amount of fibre and ships by far the greater quantity of it abroad, whilst in the other countries the consumption considerably exceeds the crop, except in Italy where it is almost equal to it; England consumes 4.5 times more than it produces, Austro-Hungary 2.6 times, Belgium 1.7, France 1.5, and Germany 1.4 times.

Upon comparing the relative numbers of flax spindles and power looms in the various European countries, the following results are obtained:

|                           | SPINDLES. | LOOMS.  |
|---------------------------|-----------|---------|
| Great Britain . . . . .   | 1,168,793 | 52,187  |
| Russia . . . . .          | 412,588   | 12,284  |
| France . . . . .          | 400,000   | 18,821  |
| Austro-Hungary . . . . .  | 328,053   | —       |
| Belgium. . . . .          | 307,940   | 4,755   |
| Germany . . . . .         | 270,000   | 11,000  |
| Italy . . . . .           | 43,000    | 772     |
| Other countries . . . . . | 31,746    | 2,676   |
| Total . . . . .           | 2,962,120 | 102,495 |

The number of spindles and looms in Russia, shown in the above table, have been calculated to a working year of 3,000 hours, and is only exceeded by Great Britain with reference to the number of spindles, and occupies the third place according the number of power looms.

The next table gives the hemp crop and the consumption in the same countries taken from statistics during the period of 1884 to 1888:

|                          | CROP.     | CONSUMPTION. |
|--------------------------|-----------|--------------|
| P o u n d s .            |           |              |
| Russia . . . . .         | 8,500,000 | 5,039,000    |
| Italy . . . . .          | 4,500,000 | 3,547,000    |
| Austro-Hungary . . . . . | 4,270,000 | 4,403,000    |
| France . . . . .         | 2,500,000 | 3,522,000    |
| Germany . . . . .        | 850,000   | 2,290,000    |
| Belgium. . . . .         | 60,000    | 428,000      |
| Great Britain . . . . .  | —         | 3,239,000    |

Thus in only two countries is the consumption less than the crop produced, and the Russian factories consume only a little more than half the crop. In Austro-

Hungary the production and consumption are about equal; Great Britain grows no hemp; in France the ratio is 1 to 4, in Germany 2 to 7, and in Belgium, 7 to 1, respectively, between the crop and the consumption.

As regards quality, it may be observed that the continuous decrease in the small amount of imported goods of this branch of manufacture is a proof of improvement in the quality of the Russian flax and hempen goods, and also of the satisfactory progress of manufacture of jute textile fabrics, lately started here. The flax spinners and linen manufacturers, stimulated by the increasing demand for cotton goods and the rapid success of the jute trade, have laboured to improve the quality and excellence of their wares.

At present, besides the Zhirardovsk mill, of Hill and Ditrich, which has long been famed for the variety and excellence of its goods, such as yarn as fine as № 160, and that of Gribanov, who has been spinning fine yarn, № 140 to № 160 for many years and making high class linen from the excellent Vologda fibre in the vicinity, there are many other mills spinning Nos. 50 to 60, and even small quantities of № 70 from the highest quality of Russian raw material, and Nos. 100 to 120 from imported Belgian flax. The combings and tow are used for warp, Nos. 4 to 25, and weft Nos. 6 to 22, and the combed flax for warp, Nos. 3 to 90, and weft Nos. 24 to 70. The difficulty of weaving fine yarn not only consists in the using of high class imported flax, but the cost of manufacturing it in Russia is very high as the spinning jennies for fine yarn are not productive, and therefore their amortization is very expensive; furthermore, as there are no works in Russia for making spinning machinery it has to be ordered abroad, thus consequently greatly increasing the price of the yarn.

Besides the usual old-fashioned unbleached, half-bleached and bleached kinds of coarse stuffs, such as sailcloth, tarpaulin, lining, canvas, raven's duck, shirting from  $\frac{1}{4}$  to  $\frac{6}{4}$  arshines wide, flemish linen  $\frac{1}{4}$  to  $\frac{12}{4}$  arshines wide, sacking, and ticking made of Nos. 6 to 20 yarn in large quantities, the Russian mills turn out from Nos. 20 to 70 a variety of medium fine narrow linen  $\frac{1}{4}$  to  $\frac{5}{4}$  arshines wide, and sheeting  $\frac{3}{4}$  to  $\frac{16}{4}$  arshines wide, generally sold ready bleached. The finer qualities, such as linen, batist, handkerchiefs, are made partly of local and partly of imported yarn, and in comparatively small quantities, and usually when specially ordered. The medium fine goods leave nothing to be desired at present, either in weaving, bleaching or dressing. As has been already said, the manufacture of low class and medium linen is, besides the great expense of weaving fine yarn, stimulated to compete, at all events within certain limits, with cotton goods, and cheap good linen still finds a ready sale with the middle and lower classes. The manufacture of damask table linen, a most difficult branch of the trade and therefore only open to the best mills, is also making constant progress, and at present many of the factories are making tablecloths and napkins both unbleached and bleached and with coloured borders, or half-linen in colours or with a coloured silk weft in various distinct designs.

The manufacture of hemp goods is undoubtedly also improving. Besides ropes, cord, string, fishing nets, sacking and sailcloth, hemp mattresses, covers, fire hose, belting, tablecloths, napkins, stuffs for covering furniture and for making curtains, are also manufactured.

The jute manufacture is mostly limited to sackcloth, but it also includes plain and coloured stair carpets, mats, furniture stuffs and other goods.

## COST OF MANUFACTURE.

The first quality, pure flax yarn, is sold at 60 to 50 kopecks per pound-number, weft Nos. 20 to 100, and 65 to 55 kopecks per pound-number, same numbers warp. Second quality, combed yarn, Nos. 18 to 14, is quoted at 11 to 9.50 roubles per pound, with a difference of 75 kopecks for every two units in the number. Nos. 12 and 10 cost 8.50 and 9 roubles, respectively, per pound; and lastly Nos. 4 to 8 are sold at 5.50 to 7.50 per pound, with a difference of 1 rouble per pound-unit of number. The prices given refer to raw yarn as it usually comes into the linen factories.

The cost of manufacturing flax yarn is as follows: cost of combed flax suitable for Nos. 20 to 70 yarn is about 25 kopecks per pound-number; the combings used for yarn Nos. 4 to 18 cost 44 to 26 kopecks per pound-number; the spinning of combed flax averages 18 kopecks per pound-number. The spinning-cost of the combings is determined by the formula:

$0.16 N + (1.2 \text{ to } 1.5)$ , which gives the price of one pound of yarn in roubles. The cost of spinning jute yarn Nos. 4 to 6 is about 2 roubles per pound.

The mean price of first class Russian linen varies from 25 to 65 kopecks per arshine, 1 arshine being equal to 28 inches. The following table shows the cost of manufacture per arshine of linen  $\frac{3}{4}$  arshine wide, from boiled yarn:

| Sorts of linen. | Nos. of yarn. | Cost of yarn in kopecks. | Cost of weaving and bleaching in kopecks. | TOTAL COST IN KOPECKS |
|-----------------|---------------|--------------------------|---|-----------------------|
| № 1             | 20/24         | 16.50                    | 6.19                                      | 22.69                 |
| » 2             | 24/30         | 18.00                    | 6.53                                      | 24.53                 |
| » 3             | 28/30         | 19.50                    | 6.86                                      | 26.36                 |
| » 4             | 30/36         | 21.48                    | 7.31                                      | 28.79                 |
| » 5             | 34/40         | 23.28                    | 7.72                                      | 31.00                 |
| » 6             | 40/50         | 25.76                    | 8.26                                      | 34.02                 |
| » 7             | 46/56         | 27.80                    | 8.72                                      | 36.52                 |
| » 8             | 50/60         | 29.10                    | 9.08                                      | 38.18                 |
| » 9             | 56/70         | 31.72                    | 9.60                                      | 41.32                 |
| » 10            | 60/70         | 33.16                    | 9.92                                      | 43.08                 |

The expense of the weaving and bleaching approximately amounts only to one-fourth of the cost of the finished goods, or about one-third of that of the yarn.

## CONCLUSION.

A knowledge of the present condition of the manufacture of goods from fast vegetable fibres leads to the inevitable conclusion that this branch of trade is thoroughly developed, and fully capable of satisfying the internal demands. Russia is

quite able to compete with the foreign manufacturers of linen of medium fineness, which finds in general a most ready sale. The import of foreign goods is limited to an inconsiderable quantity of specially fine wares. Although the manufacture of this latter class of goods is also making progress of late years in Russia, thanks especially to the good results of the initiative and cooperation of the Agricultural and Farming Department in cultivating high class fine fibres, still in reality this import does not materially injure the interests of the Russian trade, because there is such a limited demand for such goods that it would not be very advantageous to manufacture them at home. The raw material being for the greater part suitable for textile fabrics of medium fineness, it is best for the Russian mills to keep to that quality which can be made cheaper than in any other country, and as the universal demand for them is enormous the sale of Russian goods has every chance of increasing abroad.

The manufacture of hempen and jute goods continues to keep pace with the increasing demand for them, and in any case the supply is at present quite equal to the internal demand.



## CHAPTER III.

## Woollen goods.

**O**WING to the severe climatic conditions of Russia, where in many parts warm clothing must be worn during eight or nine months of the year, woollen goods are an absolute necessity. Coarse woollen tissues for supplying the wants of the poorer classes of inhabitants, have for years been made by hand, in the homes of the peasants. Consequently sheep form a necessary part of the belongings of the poorest peasants, as much so as a horse, a cow, or any other domestic animal. At the present time in many governments the peasant classes use goods fabricated by themselves. They make hand-spun yarn, which is woven into coarse grey cloth for clothing purposes, on looms of the simplest construction. Besides this, wool is used in the peasant household for making felt, felt boots and gloves.

Comparatively speaking, it is not long since such an industry of coarse woollen goods was universally spread throughout the villages, but with the lapse of time and the spread of cheap woollen goods manufactured in mills, this trade gradually sank, and in many parts there remain only the manufacture and rolling of felt boots. The making of cloth and other woollen goods is at the present time sufficiently developed, both as to quantity and quality. The Russian woollen industry, besides clothing the army, fully satisfies the home demand for goods of low and medium quality. Imported textures are principally fine cloths, and fashionable fancy goods.

## HISTORICAL REVIEW OF THE INDUSTRY.

The foundation of the manufacture of woollen goods in Russia was laid in the last century, during the reign of Peter the Great. These goods were first manufactured solely to clothe the army, in consequence of which manufacturers had special privileges and patents granted to them. In the year of 1712 an order was issued that the army should be clothed only with textures of Russian make. Peter the Great, considering the development of the woollen industry in Russia of

great importance, interested himself in the improvement of sheep farming, procuring from abroad experienced sheep farmers, and also did much to facilitate improvements in the manufacture of cloth from a technical point of view. Having founded Government mills, he let them to experienced parties on advantageous terms, at the same time binding the tenants to teach free of charge all those who were desirous of learning the trade. Notwithstanding many privileges and encouragements on the part of the Government, the woollen manufacture developed very slowly, and at the end of the last century the output was very small.

From the beginning of the present century the industry commenced to develop more rapidly, both in respect to quality and quantity, although at first the production sufficed solely for the wants of the Government and for the clothing of the army. In the year 1822 the woollen mills for the first time fulfilled the purpose the Government had in view in founding these establishments, as the production then reached about 4,000,000 arshines, which quantity exceeded the requirements of the Government. The remarkable increase in the woollen manufactures at this time should be attributed principally to the springing up of the Polish industry.

The government, desirous of developing this manufacture in the Vistula regions, invited woollen merchants, manufacturers and artizans from abroad, giving them various advantages, means of immigration, freedom from taxation, free use of land and forests. The small village, Lodz, situated on the river Lodka and surrounded by small woods, which guaranteed a supply of building material and fuel for a long period, was considered suitable for the construction of fulling mills, and was fixed upon as a settlement for woollen manufacturers, from Saxony and Prussia. The small German manufacturing colony thus formed in Lodz was changed in a short time, through the constant influx of the foreign manufacturing element, into a large village devoted principally to the production of woollen goods.

In 1830 the number of woollen mills in Russia was 390, with 67,000 work-people, and a production of 7,700,000 arshines of cloth. The events of 1830 compelled many of the masters to remove from the Polish to the Russian mills, which from a technical point of view greatly facilitated the development of the industry in many other parts of the Empire. Another branch of the industry made its appearance about this time, namely, the making of smooth, napless cloth. When first this manufacture was introduced it was made solely from imported yarn and continued to be so fabricated until woollen spinning mills were erected at home.

Commencing from the third decade, both branches of the woollen industry gradually developed and in the fifth decade assumed considerable dimensions; thus, during the time of the Crimean campaign in 1856, woollen mills could easily supply 13,000,000 arshines for the clothing of the army.

The further progress made in the manufacture of woollen goods is shown in the following diagram, Fig. 1, the value of yearly output being collected from official statistics: A, total production of woollen goods; B, manufacture of cloths; C, manufacture of napless woollen, and half-woollen goods; and also in diagrams showing the importation of foreign goods, Fig. 2; D, the importation of yarns; E, the import of goods, unknitted and woven. On examining these diagrams, the unceasing and gradual growth of both branches of the woollen industry up to the seventh decade must be remarked; attention must also be given to the proportionate de-



FIG. 1.

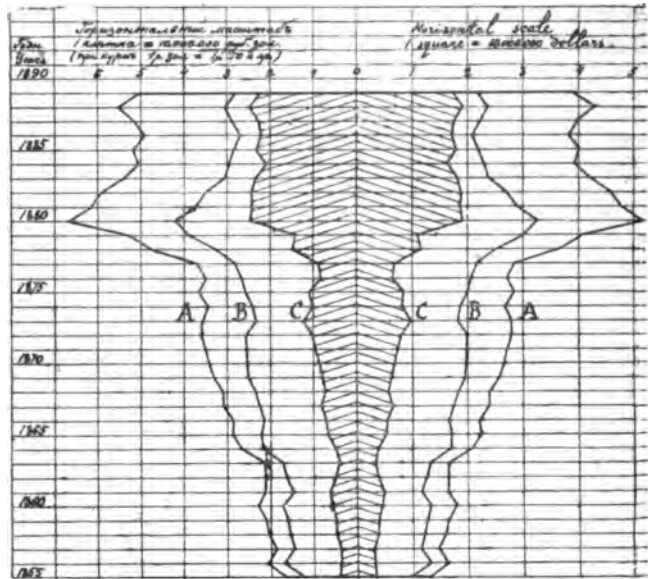


Fig. 1. Diagram of annual output: A, total production ; B, manufacture of wool-  
len cloths ; C, napless cloths ; on the left, in tens of millions of roubles gold ; on the  
right, in tens of millions of dollars.

FIG. 2.

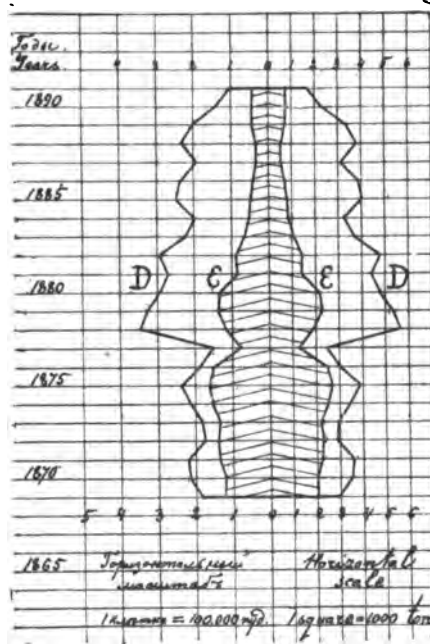


Fig. 2, Diagram of imports over European frontiers: D, yarn ; E, goods ; on  
the left, in hundreds of thousands of pouds ; on the right, in thousands of tons.

velopment of both these branches. After the temporary bad trade from 1875 to 1877, there was a general revival of Russian industry and trade at the termination of the Russo-Turkish war, and woollen mills began to work with unusual energy, but after that time, commencing from the year 1880, the woollen manufacture began to curtail its production, and from 1884 to 1886 was in a critical state.

An especial falling off was observed, in the manufacture of woollen textures, but at the same time the production of napless cloths suffered in a considerably less degree. This crisis in trade was caused by the mills increasing their production disproportionately to the demand. There was a surplus of manufactured goods, and these goods, not finding a sale, were thrown on the hands of the manufacturers, which caused a temporary stoppage of work in the mills.

In the eighth decade there were bad crops, even in the best growing districts, and this had great influence in reducing the consumption. During this time the Polish regions suffered, especially Lodz, Zgersch, Tomashov and Pabianitsa. The manufacture of woollen goods developed considerably in this district during the years 1870 to 1880, the output having increased more than five times. Such a development in production, which was not in proportion to the demand and exceeded the requirements of the most favourable years, called forth a reckless competition between the manufacturers, and had an effect on the quality of manufactured goods, cheapness of production being the principal aim, and consequently goods of Polish fabrication lost the reputation they once held. Owing to this departure a considerable amount of shoddy, many times exceeding the quantity made in the whole of the Empire, began to be manufactured in the Polish districts. Small spinning mills prepared the yarn from woollen waste, artificial wool and cotton, and these mills had a great effect in reducing the sale of goods made by large manufacturers of irreproachable integrity.

The state of trade in 1884 was so bad that several mills were closed, and others reduced the number of working hours. Many hands were thrown out of employment and were only able to exist through the attention given to their condition by the large mill owners, who opened cheap dining rooms and in other ways voluntarily assisted them.

From the latter part of the year 1886 an improvement in the woollen manufacturing industry was noticed, although the improvement was comparatively slow, and was principally apparent in the manufacture of napless goods, ordinary woollen goods remaining almost in the same condition as in the sixth decade. At the same time it must be acknowledged that the general production during the period 1880 to 1890 developed considerably, in comparison with the years 1870 to 1880. (See diagram A, Fig. 1.)

With reference to the quality of production it must be remarked that great studies and alterations have been made of late years. Up to the commencement of the eighth decade, as is seen by glancing at the diagram, both branches of the woollen industry, the fabrication of cloth and the making of napless woollen and half woollen textures, developed parallel with each other. At the end of the seventh decade, both branches acquired a considerable increase, and then the manufacture of cloth fell rapidly, but at the same time that of napless goods, which at the present time does not fully comply with the demand, remained almost unaltered. Thus, of late years an

increased manufacture of napless texture is noticed, owing to the influence of fashion, which is causing them to come more and more into use.

The increased manufacture of combed wool goods has had a beneficial effect on the condition of combed wool spinning. The latter up to the eighth decade developed very slowly and consisted of very few mills, having a total of spindles not exceeding 40,000 in number. From the year 1880 woollen spinning progressed rapidly and during the last ten years, large mills have made their appearance one after the other. The manufacture of combed yarns is developing very rapidly in the Polish district, whereas, in the Moscow district, during the last twenty years, no changes have been made in this respect. At the present time, three-quarters of the number of spindles in the Empire are at work in Poland.

### RAW MATERIAL AND ITS QUALITIES.

The greater portion of the raw wool used in the Russian manufactories is home-grown, and the remainder is imported. For coarse goods common Russian wool is exclusively used; for fine, native and foreign merinos. But unfortunately it is impossible to give authentic official data of the quantity of wool used in the Russian industry, although an approximate idea may be obtained in respect to the merino wool from the following statistics: the total amount collected in Russia is about 2,000,000 pounds, of which 500,000 pounds are sent abroad, so that Russian mills consume 1,500,000 pounds of native raw wool. The total amount of common wool collected in European Russia may be approximately estimated at 5,000,000 pounds, of this amount a part goes to the mills, part for home use and the remainder is sent abroad.

With respect to the character of Russian merino wool, investigations made by a special committee, appointed by the Minister of Crown property, show that the Russian sheep farmers aim in the following direction. The predominating breed of sheep is the so-called *shtofni* (silk-wool), which gives half combing wool, with a staple reaching six centimetres. This wool is used for making teased and smooth woollen textures. The opinion of the Commission is that under the existing circumstances, such a direction in sheep farming is the most correct, and the South Russian sheep farmers should adhere to it. The Kharkov Wool Company shows that this is the wool mostly used by Russian manufacturers, consequently it has a natural home market. Secondly, taking into consideration the economic and climatic conditions of the country, this breed of sheep, possessing as it does a strong organism in consequence of which it is not exacting in respect to food, and being furnished with a fleece of close staple, is able to withstand the severe winters.

Combing wool occupies the second place in the sheep farming industry, being used for the preparation of unscoured tissues only. Although this branch already possesses a fully acclimatized breed of sheep (*infantado*), corresponding to the German combing wool type, still it cannot yet be placed in the position it should occupy, as the preparation of combed wool has only latterly commenced to develop to any great extent. It is to be hoped that with the growth of the industry and the increased demand for combed yarn this branch will occupy a position as influential as

that occupied at the present time by the silk-wool sheep. The production of short, fine breed wool, with a staple of four centimetres, occupies the last place. Under the influence of fashion, which has favoured smooth, unscoured cloth, and owing to the decline in the woollen industry, the high position once occupied by this branch has necessarily surrendered to the two preceding branches.

Russian spinneries are supplied with foreign as well as with native wool. The import for the fifteen years from 1877 to 1891, is estimated as follows:

| YEARS.          | Various wools, raw combed, dyed and artificial. | I N C L U D I N G.     |                              |                                  |                  | Value of various wools imported. |
|-----------------|---|------------------------|------------------------------|----------------------------------|------------------|----------------------------------|
|                 |   | Raw wool.              | Combed, dyed and artificial. | Dyed wool excluding combed dyed. | Artificial wool. |                                  |
|                 |   | In thousands of pouds. |                              |                                  |                  | In thousands of paper roubles.   |
| 1877. . . .     | 202   | —                      | —                            | —                                | 11               | 3,539                            |
| 1878. . . .     | 446   | —                      | —                            | —                                | 28               | 8,582                            |
| 1879. . . .     | 647   | —                      | —                            | —                                | 30               | 12,590                           |
| 1880. . . .     | 523   | —                      | —                            | —                                | 14               | 9,490                            |
| 1881. . . .     | 473   | —                      | —                            | —                                | 5.8              | 10,108                           |
| Average . . . . | 459   | —                      | —                            | —                                | 17.8             | 8,862                            |
| 1882. . . .     | 509   | —                      | —                            | 168.1                            | 7.9              | 11,845                           |
| 1883. . . .     | 380   | 216.7                  | 47.3                         | 45                               | 71               | 10,192                           |
| 1884. . . .     | 301   | 182.6                  | 61.4                         | 24                               | 33               | 7,923                            |
| 1885. . . .     | 374   | 250.4                  | 65.6                         | 24                               | 34               | 9,205                            |
| 1886. . . .     | 310   | 181.4                  | 71.6                         | 22                               | 35               | 7,418                            |
| Average . . . . | 341.3   | 207.8                  | 61.4                         | 22.8                             | 43.3             | 8,685                            |
| 1887. . . .     | 308   | 139.5                  | 119.5                        | 23                               | 26               | 7,795                            |
| 1888. . . .     | 550   | 346.5                  | 148.5                        | 43                               | 12               | 13,502                           |
| 1889. . . .     | 492.3   | 271.8                  | 176.5                        | 34.1                             | 9.9              | 9,573                            |
| 1890. . . .     | 416   | 197                    | 189                          | 20.6                             | 9.4              | 14,100                           |
| Average . . . . | 441.6   | 238.7                  | 158.4                        | 30.2                             | 14.3             | 11,243                           |
| 1891. . . .     | 337   | 203                    | 116                          | 18*                              | —                | 10,296                           |

Taking into consideration that under the heading of raw wool, scoured wool which loses about 20 per cent in scouring forms a principal part, it may be estimated that about 380,000 pouds of pure woollen fibre (raw wool, combed and dyed) are collected. Bearing in mind that one poud of clean wool is obtained from three pouds of unscoured, it may be presumed that the amount of foreign wool imported is equal to 1,100,000 pouds unscoured. Thus the total amount of unscoured merino wool used in Russia is about 2,600,000 pouds. .

\* Artificial wool is included in this quantity.

A considerable amount of raw material, imported into Russia, is used for the spinning of combed wools. The principal part of this is received in the combed state. the quantity of late years being about 160,000 pounds, which is equal to 475,000 pounds of unscoured merino wool, and the remainder is received uncombed. The import of foreign raw material is accounted for in the following manner: merino wool of medium fineness is produced in Russia in quantities considerably above the demand for home manufacture. In the combing-wool industry a fibre from two to three inches long is required, of which a sufficient quantity is found in the regions of the Don. Wool in the Kharkov government is finer than that of the Don, but is too short in staple and is more suitable for carding than combing. But notwithstanding the considerable production of merino wool it is partly imported, the reason assigned being the more rapid development of the spinning than of the combing department, in consequence of which there arises a necessity for foreign combed wool.

The impossibility of procuring fine classes of wool in the Empire obliges Russian manufacturers to refer to foreign markets, notwithstanding that a considerable duty has to be paid on imported material. Although Russian combing wools from the districts of Rostov-on-Don and Novorossisk, and also wool from several noted sheep farmers, may be with justice acknowledged as first class products, at the same time generally speaking they cannot be classed higher than second quality, as the first sort AAA is not met with; and for the manufacture of yarns of first quality Russian manufacturers are obliged to have recourse to foreign products. It should be stated that fine wool, AAA and AA, required for combed wool spinning, is three to four time less than the classes A, B and C. Consequently Russian sheep are in a position to supply the greater part of the home demand. Wools are received from Buenos Ayres and from the colonies Sydney, Adelaide and Port Philip. The quality of colonial raw material in general must be acknowledged to be higher than Russian in respect to fineness; also each of the large number of different kinds of colonial wool has its own distinct and constant type, whereas several of the Russian kinds, often in consequence of incorrect farming and breeding, vary in quality.

Of the quality of raw material used in Russian manufactories a clear insight may be obtained from the interesting statistics, given by one of the large Russian woollen spinneries and fully substantiating the above mentioned position; this mill during three years bought in the Don district about 300,000 pounds of unscoured merino wool, which after sorting gave the following results:

| CLASSES OF WOOL. | 1889.                               | 1887. | 1888. |
|------------------|-------------------------------------|-------|-------|
|                  | T h o u s a n d s o f p o u n d s . |       |       |
| AA. . . . .      | 2.24                                | 0.49  | 0.26  |
| A twist. . . . . | 29.30                               | 21.50 | 24.70 |
| A weft . . . . . | 12.43                               | 13.52 | 15.58 |
| B . . . . .      | 33.86                               | 39.96 | 47.63 |
| C . . . . .      | 7.74                                | 17.43 | 13.56 |
| Waste * . . . .  | 2.78                                | 2.71  | 3.16  |

\* By waste is understood, wool which is unfit for combed spinning; it is sold at a low price to woollen mills.

From these statistics it will be seen that Russian wool does not include any of the very fine brand, AAA. Wool of the second degree of fineness, AA, is contained in small quantities in the Russian fleece, and a gradual depreciation in this respect is yearly noticeable. The same condition is seen in France. According to the investigations of the Industrial Society of Rheims, the fineness of the fibre of French merino wool has depreciated 20 per cent during the last thirty years. In the year 1889 the manufactory produced 75,000 pounds of twist, weft and doubled yarns, class AAA, class AA and classes A, B and C. One-half of the necessary amount of combed wool was prepared in the mill and the other half was procured from foreign markets. For the manufacture of yarns classes AAA and AA wool were imported, part of which was combed and part was scoured.

Artificial as well as natural wool is brought into Russia, but the import latterly has diminished visible and at present amounts only to about 14,000 pounds per year. There are eighteen artificial woollen mills, scattered in the Polish district, possessing breaking machinery for preparing such product, with a total production of about 200,000 pounds. This material finds a market, owing to its cheapness. Taking the price of woollen rap of low quality at from 60 kopecks to 3 roubles per pound for cloth, flannel and hosiery, and from 3.50 to 6.50 roubles for higher class, as thibet and clean kamgarn, artificial wool in a finished state is valued at from 4.50 to 15 roubles per pound.

Weft yarn is prepared from artificial wool with a mixture of 15 to 85 per cent of natural wool, or of cotton, for the better union of the short fibres and for strengthening the yarn. The adoption of artificial wool in the preparation of cloth is a thing not to be desired on account of the non-durability of the textures made from it, and because of the possibility of making at home fabrics of normal strength and quality. At the same time, the use of artificial wool for the under-weft may be acknowledged as suitable, and reduces the cost of manufacture. Although in Russia, the manufacture of artificial wool up to the present time has developed comparatively rapidly, still at the same time it may be definitely stated that it has not extended to such a degree as abroad, for instance in Germany and Austria. In Germany according to investigations by Grothe and Höhnel, instances are very rare where artificial wool is not used in fulled woollen textures.

A check to the development in Russia of this undesirable branch of the woollen industry has been given by the customs tariff measures, namely, the imposing of a considerable duty on artificial wool itself, as well as on foreign rags, which are more or less indispensable in the manufacture of higher classes of this wool. Russian manufactories cannot dispense with foreign materials, as Russian rags are coarser, and as the woollen rag business in Russia, in general, is not so well organized as abroad.

#### IMPORT OF FOREIGN GOODS.

Carded woollen yarns are imported only in insignificant quantities as the home product is sufficient to supply the demand for home weaving. With respect to Saxon and English combed yarns, Russian woollen spinners turn out much too little to supply the constantly increasing manufacture of unfelted goods.

The import of various yarns over the European frontiers for the last fifteen years is shown in the following data:

| POUDS AND PAPER ROUBLES IN THOUSANDS. |        |          |          |        |          |          |        |          |
|---------------------------------------|--------|----------|----------|--------|----------|----------|--------|----------|
| Years.                                | Pouds. | Roubles. | Years.   | Pouds. | Roubles. | Years.   | Pouds. | Roubles. |
| 1877 . .                              | 153    | 7,987    | 1882 . . | 299    | 16,872   | 1887 . . | 196    | 9,727    |
| 1878 . .                              | 349    | 15,905   | 1883 . . | 231    | 12,239   | 1888 . . | 236    | 11,069   |
| 1879 . .                              | 332    | 17,105   | 1884 . . | 202    | 10,684   | 1889 . . | 209.7  | 9,172    |
| 1880 . .                              | 294    | 14,916   | 1885 . . | 252    | 12,244   | 1890 . . | 141    | 6,586    |
| 1881 . .                              | 275    | 13,944   | 1886 . . | 240    | 11,137   | 1891 . . | 117    | 5,699    |
| Average                               | 281    | 13,971   | —        | 245    | 12,635   | —        | 180    | 8,451    |

As has been shown above, the given figures principally characterize the import of combed yarns. On examination of these statistics one must be convinced of the gradual decrease in the use of foreign manufactures. Such a state of affairs cannot be accounted for solely as the result of the customs tariff measures; it depends principally upon the considerable measure of the development of the home industry. During the last ten years combing spinneries have been founded in quick succession, and woollen spinners, after considerable stagnation, have made visible and rapid progress. It is true that the newly opened mills use foreign raw material extensively, and that the import of combed wool for the period 1887 to 1890 increased two and one-half times, in comparison with the four previous years. At the same time, such an increase in the import did not have any effect on the interests of Russian sheep farming, which suffered equally from the import of raw, semi-prepared and finished wool. Nevertheless, the substitution of imported raw material for imported fabrics has without doubt tremendous significance in favour of the industry itself. Certainly if the periods of 1882 to 1886 and of 1887 to 1890 be compared it will not be difficult to arrive at the conclusions that the value of imported yarns and wool for the latter period decreased 1,600,000 roubles; that the import of yarns diminished 65,000 pouds; that of wool increased 100,000 pouds; and that the greater part of the latter amount (97,000 pouds) fell to the lot of combed wool in the sliver.

Taking 95 per cent as the issue of yarn from a unit of wool, it is found that Russian spinneries, having used 97,000 pouds of foreign combings, deliver to the weavers about 92,000 pouds of yarn, which at the average cost of 65 roubles per poud for № 56 yarn, forms a value of about 6,000,000 roubles. Thus, owing to the import of combed wool in the sliver, which was necessary on account of the development of spinning, the import of yarn decreased, in consequence of which 7,600,000 roubles remained in the Empire. This sum under other circumstances namely the prohibiting the import of foreign combed wool, would have been paid to foreigners for prepared yarn, as all those spinneries which did not possess combings would have been unable to work. Out of the total of 150,000 spindles for spinning combed yarn from 50,000 to 75,000 of these up to the present time are not supplied with their own combing departments, as may be judged from the amount of imported combed wool.

The import of woven (felted and napless) and knitted goods for the years from 1877 to 1891 is shown in the following table:

| POUNDS AND PAPER ROUBLES IN THOUSANDS. |         |          |          |         |          |          |         |          |
|--|---------|----------|----------|---------|----------|----------|---------|----------|
| Years.                                 | Pounds. | Roubles. | Years.   | Pounds. | Roubles. | Years.   | Pounds. | Roubles. |
| 1877 . .                               | 76.6    | 6,547    | 1882 . . | 91.7    | 8,962    | 1887 . . | 33.7    | 2,680    |
| 1878 . .                               | 119.1   | 10,538   | 1883 . . | 65.7    | 6,520    | 1888 . . | 31.6    | 2,309    |
| 1879 . .                               | 140.9   | 12,321   | 1884 . . | 54.2    | 5,468    | 1889 . . | 45.5    | 3,276    |
| 1880 . .                               | 134.7   | 12,102   | 1885 . . | 51.5    | 4,618    | 1890 . . | 48.1    | 3,506    |
| 1881 . .                               | 88.9    | 7,710    | 1886 . . | 41.6    | 3,683    | 1891 . . | 42.2**  | 3,307    |
| Average .                              | 114.0   | 9,844*   | —        | 60.9    | 5,850*   | —        | 40.2    | 3,016*   |

From the above statistics it will be seen that the import of foreign goods, estimated generally in small quantities, gradually diminishes, the latter period showing a decrease of 33 per cent as compared with that from 1877 to 1881. Russia is principally supplied with napless goods, the import of which for the period 1877 to 1881 is twelve and one-half times greater than that of felted goods, fine cloths forming a principal part of the latter. The comparatively large amount of combed wool goods imported is accounted for as follows: Notwithstanding the rapid progress made in spinning in Russia of late years part of the material required for the manufacture of light woollen and half-woollen textures up to the present time has to be imported. In the same manner in respect to fashionable colours and designs for these goods, the home woollen weaving mills are also dependent upon the varying demands, which are regulated abroad, principally in France.

The total value of import of woollen yarns and goods is considerable in comparison with the home production, as is apparent from the following comparison of values of imports and the amount of yearly output in the manufacture of woollen textures.

| PERIOD OF TIME. | Relative value of imported wools and yarns to yearly turnover. | Relative value of imported woollen goods to the yearly turnover. |
|-----------------|--|--|
|                 | PER CENTS.   |  |
| 1855—1859. . .  | 11   | 7  |
| 1860—1864. . .  | 11   | 8  |
| 1865—1869. . .  | 16   | 10   |
| 1870—1874. . .  | 27   | 21   |
| 1875—1879. . .  | 30   | 16   |
| 1880—1884. . .  | 27   | 9.5  |
| 1885—1889. . .  | 26   | 5  |

\* Including the value of Turkish goods.

\*\* Excluding knitted goods.



As may be seen from the data given, the increase in the import of raw wool and yarns confirms the statement already made, that sheep farming and wool spinning in Russia do not develop in the same degree as the weaving of woollen textures, in consequence of which recourse must be had to foreign markets to make up the insufficient supply of materials. As regards the wool-weaving industry the same statistics show that from the middle of the seventh decade foreign stuffs began in a great measure to be replaced by those of Russian manufacture, and at present the production almost suffices for home requirements.

In valuing the import into Russia of wool and woollen goods it is interesting to become acquainted with statistics of the Russian export trade. Common and merino wools, combings, cloth cuttings, goat hair, woollen yarns and goods are exported from Russia. The principal object in the foreign trade is raw wool, the export of which from 1869 to 1891 is explained in diagram, Fig. 3, showing: A. exports over European frontiers of common Russian wool; B, unscoured merino; C, scoured merino. Exports were made also over Asiatic frontiers, but in considerably smaller quantities; during the years 1860 to 1890 about 190,000 pounds, to the value of 1,273,000 roubles, were exported annually, which consisted solely of common wool.

FIG. 3.

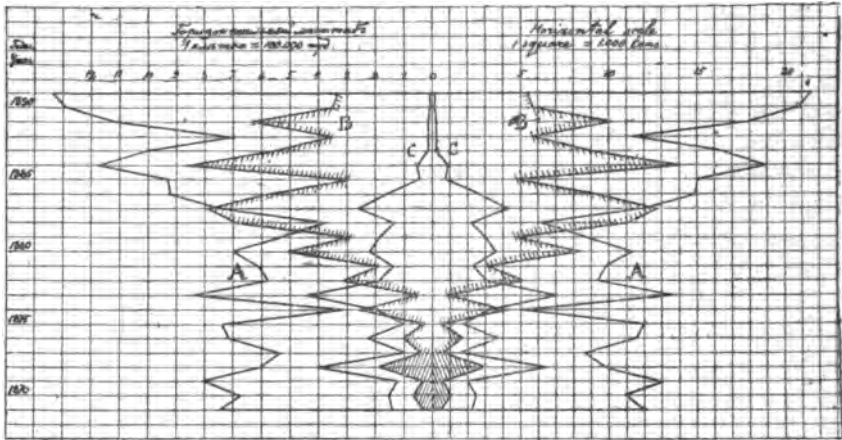


Fig. 3. Diagram showing exports over European frontiers: A, common Russian wool; B, unscoured merino; and C, scoured merino; on the left, in hundreds of thousands of pounds, and on the right, in thousands of tons.

On examining these diagrams the following conclusion is reached. The export of wool undergoes considerable fluctuation; that of common wool increases, and merino on the contrary decreases, especially of scoured merino. Comparing the diagram of export of wool with that of import, D, various wool, E, various, excepting combed, and F, combed in the sliver, it must be acknowledged that the exports con-

siderably exceed the imports. In reference to the merino wool trade, the import of foreign material is nearly three times greater than the export.

The export principally consists of common Russian wool, as is seen from the following data of the average annual exports over the European frontier, for the last three periods of five years each.

FIG. 4.

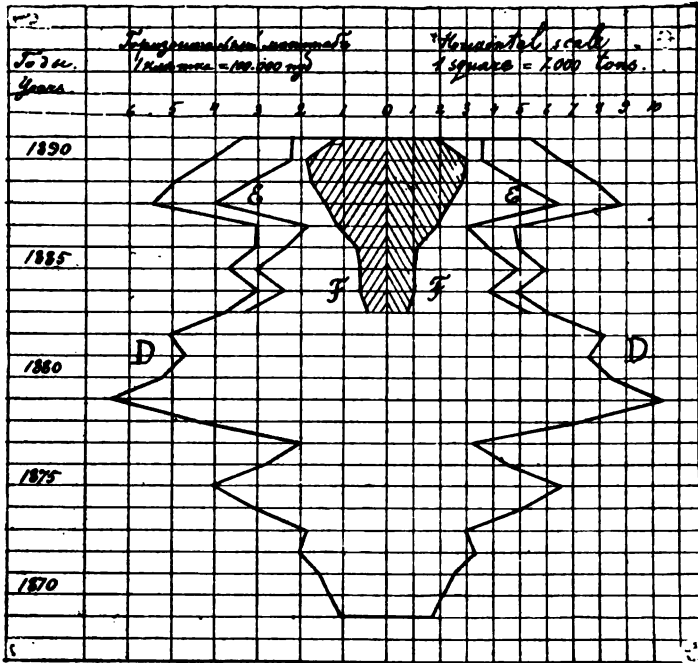


Fig. 4. Diagram showing imports over European frontiers: D, various wools; E, various, excepting combed; F, combed. in the sliver; on the left, in hundreds of thousands of pouds; on the right, in thousands of tons.

| FIVE YEARS PERIODS.     | Common Russian wool. | Merino wool. |          |
|-------------------------|----------------------|--------------|----------|
|                         |                      | Unscoured.   | Scoured. |
| IN THOUSANDS OF POUNDS. |                      |              |          |
| 1877—1881. . .          | 655                  | 227          | 249      |
| 1882—1886. . .          | 635                  | 645          | 134      |
| 1887—1891. . .          | 1,094                | 449          | 10       |

Besides raw wool, woollen goods, although in small quantities, are exported from Russia. Their export over the European frontier is shown as follows.

| YEARS.  | Various<br>woollen<br>materials. | Including  |       | YEARS.  | Various<br>woollen<br>materials. | Including  |        | YEARS.  | Various<br>woollen<br>materials. | Including  |        |
|---------|----------------------------------|------------|-------|---------|----------------------------------|------------|--------|---------|----------------------------------|------------|--------|
|         |                                  | Cloth.     | Felt. |         |                                  | Cloth.     | Felt.  |         |                                  | Cloth.     | Felt.  |
|         |                                  | In pounds. |       |         |                                  | In pounds. |        |         |                                  | In pounds. |        |
| 1877    | 24,595                           | 2,538      | —     | 1882    | 27,757                           | 3,693      | —      | 1887    | 30,147                           | 1,401      | 26,371 |
| 1878    | 23,847                           | 11,988     | —     | 1883    | 25,474                           | 3,885      | 17,403 | 1888    | 36,859                           | 7,378      | 27,944 |
| 1879    | 25,273                           | 13,293     | —     | 1884    | 23,486                           | 2,154      | 15,611 | 1889    | 49,410                           | 15,460     | 32,616 |
| 1880    | 40,626                           | 29,555     | —     | 1885    | 46,408                           | 24,145     | 20,230 | 1890    | 35,098                           | 10,074     | 23,538 |
| 1881    | 54,210                           | 45,595     | —     | 1886    | 33,551                           | 13,219     | 18,284 | —       | —                                | —          | —      |
| Average | 33,710                           | —          | —     | Average | 31,335                           | —          | —      | Average | 37,879                           | —          | —      |

The average value of annual exports for the last ten years amounts to about 970,500 roubles. Various woollen goods at the present time are exported yearly over the Asiatic frontier to the value of 1,500,000 roubles and consist chiefly of carpets, felt and cloth, of which the principal part, to the value of 530,000 roubles yearly, is sent to Kiakhta. The foreign trade in Russian cloths has fallen considerably in comparison with that of the sixth decade, when the commercial transactions with China and Persia reached the sum of 3,500,000 roubles.

#### YEARLY OUTPUT AND TECHNICAL MEANS OF THE INDUSTRY.

According to statistical information, the condition of the woollen industry of late years is shown by the following official data.

| YEARS.    | OUTPUT IN MILLIONS OF ROUBLES. |                |                      |   |                 |                    |                               | Number of mills. | Number of work-people in thou-sands. |
|-----------|--------------------------------|----------------|----------------------|---|-----------------|--------------------|-------------------------------|------------------|--------------------------------------|
|           | Wool washing.                  | Wool spinning. | Cloth manuf-actures. | Wool weaving manufacture of napless, wool-len and half-woollen texture. | Carpet mak-ing. | Felt manu-facture. | Manufacture of knitted goods. |                  |                                      |
| 1880. . . | 15.4                           | 13.6           | 63.3                 | 36.7  | —               | —                  | —                             | 1,191            | 111.6                                |
| 1881. . . | 12.3                           | 14.8           | 56.5                 | 36.5  | —               | —                  | —                             | 1,211            | 104.1                                |
| 1882. . . | 15                             | 19.1           | 52.7                 | 36.8  | —               | —                  | —                             | 1,304            | 111.4                                |
| 1883. . . | 11.9                           | 15.9           | 46.5                 | 35.4  | —               | —                  | —                             | 1,300            | 98.9                                 |
| 1884. . . | 7.3                            | 12.5           | 44.8                 | 31.9  | 0.6             | 0.3                | 1.1                           | 1,127            | 93.8                                 |
| 1885. . . | 5.3                            | 14.3           | 42.8                 | 35.2  | 0.6             | 0.2                | 1.1                           | 947              | 98.2                                 |
| 1886. . . | 6.9                            | 19.1           | 40.8                 | 33.4  | 0.5             | 0.3                | 1.3                           | 941              | 90.2                                 |
| 1887. . . | 7.2                            | 19.4           | 43.9                 | 34.3  | 0.9             | 0.4                | 1.6                           | 987              | 75.6                                 |
| 1888. . . | 7.9                            | 20             | 46.1                 | 37.1  | 0.9             | 0.4                | 1.7                           | 1,090            | 107.2                                |
| 1889. . . | 8.5                            | 20.1           | 42.7                 | 33.9  | 1.1             | 0.6                | 2.1                           | 1,085            | 99.9                                 |

As is seen from the foregoing data the manufacture of cloth should occupy the first place in respect to the amount of yearly turnover. As regards quality, this branch of the industry is principally devoted to the production of goods of medium fineness, although at the same time there are many manufactories in Russia producing fine cloths in no way inferior to those of foreign make. The cloth industry is almost wholly supplied by yarns of home manufacture. Carded wool spinneries are principally situated near the weaving mills.

There are no very large mills that make spinning a specialty, but there are many small ones engaged in the preparation of yarns for coarse and medium kinds of textures. The manufacture of napless goods is noticeably developing. For a long time this branch of the industry was in an inactive condition, in consequence of a considerable part of the necessary material, combed yarn having to be imported. As has been before mentioned, up to the present time considerable progress has been made in combed wool spinning, and the wool-weaving industry becomes yearly more and more independent of foreign manufacturers.

In the foregoing data relating to wool spinning, a considerable part of the output should be apportioned to the preparation of combed yarns. Then with the given statistics it is possible to judge what progress has been made during the period 1880 to 1889 in combed wool spinning. The majority of the spinning mills, started of late years, managed, at least at the beginning, without wool-washing and combing establishments, receiving wool in the combed state from abroad, a natural state of affairs. The preparation of combed yarns is without doubt considered by all as a very complicated process. Washing and combing operations require quite as much capital as wool spinning. Therefore the division of this manufacture into two special branches, the same as abroad, is desirable. Russian combed wool spinning consists of about 150,000 spindles capable of producing 300,000 pounds of yarn per year, which amount is insufficient to supply the wants of the wool-weaving industry. The import of various yarns of late years has been 180,000 pounds, consisting principally of combed yarn.

Relying on the example of the west, one would think that the first aim of the industry should be the development of spinning mills, even without combing departments, to such an extent as to make them capable of adequately supplying the home demand for combed yarn. As soon as wool spinning reaches this state the second endeavour should be to make this a home branch of the industry in all its stages. For this, first of all, capital is required for the erection of spinning mills and when competition arises amongst producers of combed yarn within the Empire. then by gradually checking the import of foreign combed wool, spinning mills may be directed to the using principally of Russian wools, for the preparation is not of all kinds of yarn, at any rate those below AA. When such a state of things has arrived it may be expected that an independent industry of wool scouring and combing will gradually arise in Russia, and that Russian wool will be exported, not only in the raw, but in a half-fabricated state, scoured and combed.

As regards other branches of the woollen industry, devoted to the production of carpets, felt and knitted goods, the output is not of much consequence. It is true, these products partly form articles of rustic trade; for instance, in the government of Viatsk cheap carpets and rugs are manufactured in considerable quantities and find a sale in carriage-building establishments and at the Nizhni-Novgorod fair; in

the Caucasus the rustic manufacture of the so-called Persian carpets is widely spread; therefore, the registration of establishments supplying them is very difficult, so that the turnover of the above-mentioned branches is greater than is shown by official statistics. At the same time there is comparatively little development in the manufacture of such articles in mills, but the rustic trade or handicraft often distinguishes itself in respect to quality and design, especially in the district beyond the Caucasus and in Central Asia. The reason of this condition in respect to carpet manufacturing is: first, the comparatively limited use of such carpets as are articles of luxury, beyond the reach of the majority of the inhabitants, and are substituted by printed felt carpets, or hemp and jute floor cloths, which are inexpensive, and are prepared in large quantities; secondly, this industry is also retarded by its dependence on foreign manufactories for acquiring the necessary materials. Thus, for the fabrication of fancy carpets, cut or speckled, it is necessary to import woollen warps, printed in colours: for the preparation of carpets from dyed warps, Jacquard, it is very often necessary to have recourse to foreign goods, for the cards for Jacquard looms, as there are so many different designs.

As regards the technical means for the manufacture of woollen goods, according to statistics by the Department of Trade and Manufacture, embracing more or less the larger mills, with an annual turnover of more than 2,000 roubles, there were in 1889, 479,993 spindles; 150,000 of these were engaged in the spinning of combed yarns, and the remaining 330,000, devoted to the preparation of carded wool. The number of looms occupied in the production of woollen and half-woollen napless cloths in the same year was 34,349. In reality the number of looms engaged in the production of woollen goods is considerably more, as there are many rustic establishments, statistics of which are not forwarded to the Department. In 1879, according to official figures, there were 309,964 spindles and 25,898 looms at work. Thus during a period of ten years the increase in the number of spindles was nearly 55 per cent, and in looms, nearly 33 per cent.

In order to value the commercial side of the manufacture of woollen goods, the average costs of fabrications in all their different stages, as well as the cost of raw material and finished goods must be taken into consideration. The cost of spinning combed yarns in Russia may be ascertained from the following information. derived from the accounts of a large typical woollen spinning mill, situated in the Polish district, this district being selected because it occupies an influential position in the development of combed wool spinning. This manufactory produces combed yarn from combings, half of home preparation and half imported of the following fineness and qualities: AAA, Nos. 75 to 96: AA, Nos. 64 to 75: A, Nos. 20 to 74; B, Nos. 24 to 64; C, № 32. \* The yearly production of the spinning department, working day and night for 295 days, 6,781 working hours, amounted to 55,000 pounds of yarn, medium counts № 55.8 or 50,334,096 hanks, so that the average production per spindle in 12 hours, taking into consideration that 7.66 per cent of time is lost in stoppages, doffing and the like, was four and one-quarter hanks, 75.5 grammes, the old self-actors producing 20.5 per cent less than the new ones. The average issue was as follows:

\* A hank contains 1000 metres. The № is arrived at by the number of hanks in a kilogram

Russian unscoured wool lost in washing 67 per cent; from scoured wool 78.5 per cent of combings were derived, or from unscoured 27 per cent; and lastly 93 per cent of yarn was obtained from combings; waste, 5.5 per cent and dead loss, 1.5 per cent. The yearly production in the combing department was 30,786 pounds, at an expenditure of 18,234 roubles for wool sorting, 31,093 roubles for combing, 53,347 roubles for material, 27,410 roubles for the amortization of machinery and buildings, excluding interest or invested capital, as this item is shown in the spinning department and in the profits of the manufacturer, and total, 130,084 roubles. In this manner the cost per pound of combings was 4.15 roubles. The annual expenditure in spinning 50,334,096 hanks of yarn was as follows: wages, 129,930 roubles; fuel, 11,451 roubles; lighting, 4,461 roubles; materials, 78,027 roubles; duty and freight, 10,943 roubles; tools for re-mount, 3,283 roubles; re-mount, 5,946 roubles; insurance, 8,304 roubles; amortization of machinery and buildings, 50,053 roubles; bank interest, 14,310 roubles; sundry expenses, 34,666 roubles; profit, 42,978 roubles; total, 394,352 roubles. Consequently, the spinning of one hank of yarn from combings costs 78 kopecks. or 7.16 roubles per pound of № 56. Twofold doubling costs half a kopeck per hank.

Taking 27 per cent as the issue of combings from raw wool, that is, one pound out of 3.7 pounds of unscoured wool, and the cost at 12 roubles per pound, it is found that it takes 44.40 roubles worth of raw wool to make one pound of combings, and together with the cost of production, 48.55 roubles. Then taking the issue of yarn from a unit in weight of combings at 95 per cent, one pound of yarn of average № 56 would cost 51.17 roubles in combings, and 7.16 roubles in spinning, making a total of 58.33 roubles. As part of the waste is re-used and part sold, 95 per cent may be taken as the issue of yarn from a unit in weight of combings.

In the manufacture of carded woollen yarn the cost per pound, in spinning the kinds principally used, is as follows:

|               | S p i n n i n g . | D o u b l i n g .          |
|---------------|-------------------|----------------------------|
|               | Roubles.          | Roubles.                   |
| 1. In hanks * | 4.40 — 4.40       |                            |
| 2. »          | 4.80 — 5.20       | $\frac{2}{3}$ hanks — 1.60 |
| 3. »          | 5.20 — 6.00       | $\frac{3}{2}$ » — 1.60     |
| 4. »          | 5.60 — 6.40       | $\frac{4}{2}$ » — 2.00     |
| 5. »          | 6.00 — 6.80       | $\frac{5}{2}$ » — 2.40     |
| 6. »          | 6.00 — 7.20       | $\frac{6}{2}$ » — 3.00     |
| 7. »          | 6.80 — 8.00       | $\frac{7}{2}$ » — 4.00     |

One pound of medium yarn, three-fourths of a hank, costs in wool 23.80 roubles; in spinning, 5.50 roubles; total, 29.30 roubles. For finer yarns a more expensive wool is used, 40 to 50 roubles per pound. As regards the cost of producing textures on account of great variety in quality of material and the processes of finishing, it is impossible in a short review to give full particulars. Consequently only the more or less definite kinds of goods will be considered.

The following table may be of interest in this connection:

\* A hank contains 2,000 arshines of yarn, and the counts of the yarn are arrived at by the number of hanks in one Russian pound.

| CLASS OF GOODS.  | QUALITY AND COST OF YARNS.  |   | COST OF PRODUCTION PER PIECE. |                       |           | COST PER ARSHINE. |
|--|---|---|-------------------------------|-----------------------|-----------|-------------------|
|  | Twist.  | Weft.   | Weaving.                      | Dyeing and finishing. | Expenses. |                   |
|  | R o u b l e s .   |   |                               |                       |           |                   |
| Sateen A, width 15 vershoks, length 59 arshines.                             | № 100 <sup>1</sup> / <sub>2</sub> cotton 4 <sup>1</sup> / <sub>2</sub> pounds, 5.63 roubles.      | № 70 Botany weft 6 <sup>5</sup> / <sub>8</sub> pounds, 11.04 roubles. . . .   | 1.65                          | 3.50                  | 5.03      | 0.46              |
| Sateen, AA width 15 vershoks, length 59 arsh.                                | № 90 <sup>1</sup> / <sub>2</sub> cotton 5 pounds, 6.25 roubles.                                   | № 70 Bot. weft 7 <sup>1</sup> / <sub>2</sub> pounds 12.50 roubles.            | 1.80                          | 3.75                  | 5.60      | 0.51              |
| Cashmire, 26 vershoks wide, 52 arsh. long.                                   | № 52. Saxon AA, 5 <sup>3</sup> / <sub>4</sub> pounds 9.13 roubles.                                | № 74 Saxon AA, 10 pounds, 16.57 roubles. . . .                                | 2.40                          | 5.00                  | 7.66      | 0.73              |
| Cashmire, Indian super 25 vershoks wide, 57 arsh. long.                      | № 112 <sup>1</sup> / <sub>2</sub> Saxon AAA, 6 <sup>1</sup> / <sub>3</sub> pounds, 15.83 roubles. | № 96 Saxon AAA. 10 <sup>3</sup> / <sub>4</sub> pounds, 22.35 roubles. . . .   | 3.40                          | 6.00                  | 11.04     | 1.05              |
| Lustre, 17 vershoks wide, 55 arsh. long.                                     | № 120 <sup>1</sup> / <sub>2</sub> cotton 3.34 roubles.  | № 36 super lustre, 6 <sup>1</sup> / <sub>2</sub> pounds, 18.13 roubles. . . . | 0.80                          | 1.50                  | 1.60      | 0.23              |
| Repps, 29 <sup>1</sup> / <sub>2</sub> vershokwide, 60 arsh. long.            | № 16 <sup>1</sup> / <sub>3</sub> woollen 40 pounds, 39.33 roubles                                 | № 16 <sup>1</sup> / <sub>3</sub> woollen 26 pounds, 25.57 roubles.            | 8.92                          | —                     | 17.36     | 1.52              |
| Flannel cheviot, 29 <sup>1</sup> / <sub>2</sub> vershoks, 132 arshines long. | 4 hank. 47 <sup>1</sup> / <sub>2</sub> pounds, 49.30 roubles.                                     | 4 hank. 26 pounds, 42.43 roubles. . . .                                       | 26 r. 28 k.                   |                       | 5.76      | 0.94              |
| Woollen shawls 2 arshines, 7 vershoks square, 26 pieces.                     | 3 hank. 46 pounds. 39.33 roubles.   | 3 hank. 47 <sup>1</sup> / <sub>2</sub> pounds, 40.62 roubles. . . .           | 16 r. 77 k.                   |                       | 2.60      | 3.82*             |
| Carpets:<br>15 <sup>1</sup> / <sub>2</sub> vershoks wide, 60 arsh. long.     | Wool, cotton and jute.  | Flax yarn.  |                               | Carpet cleaning.      |           |                   |
|  | R O U B L E S .   |   |                               |                       |           |                   |
| a. Figured velvet . . . .  | 64.61   | 6.60  | 9.56                          | 0.60                  | 16.27     | 1.63              |
| b. Spotted velvet . . . .  | 49.30   | 4.05  | 7.47                          | 0.60                  | 12.00     | 1.23              |
| c. Plain velvet.   | 87.72   | 6.60  | 10.12                         | 0.60                  | 21.00     | 2.10              |
| d. Josquard. .   | 116.40  | 15.00   | 18.00                         | 0.60                  | 30.00     | 3.00              |

\* Cost per shawl.

In settling the question of cost of production of goods, and for explaining more clearly the commercial side of the industry, the data, showing the fluctuations in the price of raw wool and woollen yarn in Russia, will be found useful. Prices of wool per pound have undergone the following changes during the late years:

| PRICES OF WOOL IN RUSSIA * |   |  |                                    |  | PRICES OF WOOL IN FRANCE **.                                   |  |
|----------------------------|---|--|------------------------------------|--|--|--|
| YEARS.                     | Russian wool.   | Spanish wool.  |                                    |  | Australian A and AB scoured.                                   | № 1, Buenos Ayres and Monte Video. scoured.                    |
|                            |   | Unscoured.   | Sorted.                            | Scoured.   |  |  |
|                            |   | In roubles.  |                                    |  | Rate of exchange, 1 rouble gold = 1.50 rouble paper            |  |
| 1878 . .                   | 6 <sup>3</sup> / <sub>4</sub> —7                              | 11 —12 <sup>1</sup> / <sub>2</sub>                             | —                                  | 35 <sup>1</sup> / <sub>2</sub> —38 <sup>1</sup> / <sub>2</sub> | 51 <sup>1</sup> / <sub>2</sub> —54 <sup>1</sup> / <sub>2</sub> | 51 —54   |
| 1879. . .                  | 8 —9 <sup>1</sup> / <sub>2</sub>                              | 11 —14   | —                                  | 35 —45   | 49 <sup>1</sup> / <sub>2</sub> —43 <sup>1</sup> / <sub>2</sub> | 52 <sup>1</sup> / <sub>2</sub> —40 <sup>1</sup> / <sub>2</sub> |
| 1880. . .                  | 9 <sup>1</sup> / <sub>2</sub> —13                             | 11 <sup>1</sup> / <sub>2</sub> —13 <sup>1</sup> / <sub>2</sub> | 18 —24                             | 31 —41   | 49 <sup>1</sup> / <sub>2</sub> —45                             | 43 <sup>1</sup> / <sub>2</sub> —45 <sup>1</sup> / <sub>2</sub> |
| 1881. . .                  | 8 <sup>1</sup> / <sub>4</sub> —12 <sup>1</sup> / <sub>2</sub> | 9 <sup>1</sup> / <sub>4</sub> —12                              | 17 —23                             | 30 —37 <sup>1</sup> / <sub>2</sub>                             | 43 <sup>1</sup> / <sub>2</sub> —45                             | 42 —42 <sup>1</sup> / <sub>2</sub>                             |
| 1882. . .                  | 7 <sup>1</sup> / <sub>2</sub> —12                             | 9 —12  | 16 <sup>1</sup> / <sub>2</sub> —24 | 28 —39   | 43 <sup>1</sup> / <sub>2</sub>                                 | 43 <sup>1</sup> / <sub>2</sub> —43 <sup>3</sup> / <sub>4</sub> |
| 1883. . .                  | 7 <sup>1</sup> / <sub>2</sub> —11 <sup>1</sup> / <sub>2</sub> | 9 —12 <sup>1</sup> / <sub>2</sub>                              | 16 —23                             | 27 —36   | 45 —43 <sup>1</sup> / <sub>2</sub>                             | 45 —43 <sup>1</sup> / <sub>2</sub>                             |
| 1884. . .                  | 7 <sup>3</sup> / <sub>4</sub> —10 <sup>3</sup> / <sub>4</sub> | 9 <sup>1</sup> / <sub>4</sub> 12 <sup>1</sup> / <sub>2</sub>   | 16 —23                             | 28 —31 <sup>1</sup> / <sub>2</sub>                             | 43 <sup>1</sup> / <sub>2</sub> —42                             | 44 —40 <sup>1</sup> / <sub>2</sub>                             |
| 1885. . .                  | 7 —10 <sup>1</sup> / <sub>2</sub>                             | 8 —9 <sup>1</sup> / <sub>2</sub>                               | 14 —20                             | 27 —32 <sup>1</sup> / <sub>2</sub>                             | 42 —34 <sup>1</sup> / <sub>2</sub>                             | 41 —32   |
| 1886. . .                  | 7 —13   | 7 —11 <sup>1</sup> / <sub>2</sub>                              | 11 —24                             | 24 —36   | 30 —40 <sup>1</sup> / <sub>2</sub>                             | 32 —33   |
| 1887. . .                  | 7 —12   | 8 —10  | 13 —21 <sup>1</sup> / <sub>2</sub> | 28 —35   | 39 —34 <sup>1</sup> / <sub>2</sub>                             | 33 —33 <sup>1</sup> / <sub>2</sub>                             |
| 1888. . .                  | 7 —11   | 9 —11 <sup>3</sup> / <sub>4</sub>                              | 13 —24                             | 33 —38 <sup>1</sup> / <sub>2</sub>                             | 34 <sup>1</sup> / <sub>2</sub> —36 <sup>1</sup> / <sub>2</sub> | 33 <sup>3</sup> / <sub>4</sub> —37 <sup>1</sup> / <sub>2</sub> |
| 1889. . .                  | 6 <sup>1</sup> / <sub>2</sub> —10 <sup>1</sup> / <sub>2</sub> | 8 —10 <sup>3</sup> / <sub>4</sub>                              | 12 —23                             | 31 —35   | 37 <sup>1</sup> / <sub>2</sub> —42                             | 36   |
| 1890. . .                  | 5 <sup>3</sup> / <sub>4</sub> —9 <sup>1</sup> / <sub>2</sub>  | 7 —10 <sup>1</sup> / <sub>2</sub>                              | 12 —22 <sup>1</sup> / <sub>2</sub> | 29 —35   | 39 —37 <sup>1</sup> / <sub>2</sub>                             | 36 —34 <sup>1</sup> / <sub>2</sub>                             |
| 1891. . .                  | 6 —9 <sup>3</sup> / <sub>4</sub>                              | 7 —9   | 12 —21                             | 29 —31 <sup>1</sup> / <sub>2</sub>                             | —  | —  |
| 1892. . .                  | 6 —10 <sup>1</sup> / <sub>4</sub>                             | 7 <sup>1</sup> / <sub>2</sub> —8 <sup>1</sup> / <sub>2</sub>   | 13 <sup>1</sup> / <sub>2</sub> —21 | 29 —32   | —  | —  |

From these data it is seen: 1. that in Moscow the highest prices for Spanish wool were, in 1879 to 1880, 11 to 14 roubles per pound, unscoured, 18 to 24 roubles, rectified, and 35 to 45 roubles, scoured; 2. that from 1880 to 1886 and 1888 they constantly fell and quickly rose for a time; 3. that after the temporary improvement started, the fall in the price again commenced, continuing up to the present time. The prices of Russian common wool fluctuated with those of Spanish wools, as is evident from the foregoing table; the highest price was in 1880, after which it fell until 1886, and after a three years rise, 1886 to 1888, again began to fall. The causes of the fall in price of Russian wool, which seriously affects the interests of the Russian sheep farming, are various, the prices being dependent upon the condition of sheep farming itself, upon the demand not only of Russian, but of

\* According to quotations on the Moscow Exchange.

\*\* From data given by a large French wool-combing manufactory.



foreign markets, and also upon the direction of the wool-weaving industry. The foregoing table shows us an existing relative fluctuation in price of wool in the Russian and French markets.

The investigation of the fluctuations in prices of woollen yarn is more complicated than that of raw wool, as it is a product very irregular and varying in quality, according to the demands of the market. The following data show the fluctuation of prices in the Moscow region. According to quotations on the Moscow Exchange the price per poud in roubles for combed and carded yarns underwent the following changes:

| YEARS.          | Saxon twist         | Saxon weft    | English weft | Carded twist         | Carded weft |
|-----------------|---------------------|---------------|--------------|----------------------|-------------|
|                 | № 82<br>A, AA, AAA. | № 38—40<br>B. | № 36.        | № 9—11.              | № 9—11.     |
| 1879 . . . . .  | 72—80               | 67—71         | 43—54        | 47—48                | 49—50       |
| 1880 . . . . .  | 76—80               | 68—86         | 50—59        | 47                   | 48          |
| 1881 . . . . .  | 68—74               | 67—71         | 44—56        | 46                   | 47          |
| 1882 . . . . .  | 68—72               | —             | 45—53        | 43                   | 43          |
| 1883 . . . . .  | 72—77               | 63—68         | 44—53        | 42                   | 42          |
| 1884 . . . . .  | 72—77               | 63—68         | 44—52        | 43                   | 43          |
| 1885 . . . . .  | 65—75               | 61            | 45—54        | 37—37 <sup>1/2</sup> | 36—37       |
| 1886 . . . . .  | 60—66               | 42—58         | 43—52        | 34—36                | 31—35       |
| 1887 1 half . . | 76—88               | 73—78         | 48—53        | 43                   | 41          |
| 1887 2 half . . | 72—85               | 64—72         | 50—57        | 42                   | 40          |
| 1888 . . . . .  | 74—82               | 67—70         | 46—62        | —                    | —           |
| 1889 . . . . .  | 62—72               | 60—65         | 47—53        | 39—43                | —           |
| 1890 . . . . .  | 50—55               | 49—54         | 46—54        | —                    | —           |
| 1891 . . . . .  | 52—63               | 51—59         | 45—55        | —                    | —           |
| 1892 . . . . .  | 52—59               | 48—52         | 49—56        | —                    | —           |

According to the data given there is a rapid increase in the price of yarn in 1879 to 1880, after which it falls until 1886, when again a rise is observable. A comparison of the variation in the price of wool and yarn shows that they follow parallel with each other, the only difference being the amount of time lost at the moment of their variation. The similarity in the fluctuation in the price of yarn and wool would be more complete if the alteration in the tariff did not increase the value of yarn considerably more than that of wool. The foregoing refers to combed yarn; the value of carded yarn depends little on the variation of the customs tariff, as it is a fabrication which easily withstands foreign competition.

## CONCLUSION.

In summing up the preceding the following conclusion may be drawn: the manufacture of woollen felted goods, of coarse and medium classes, is fully developed and capable of supplying the home demands. Besides the considerable amount of cloth, supplied for clothing the army, the manufactories produce a no less considerable quantity of goods for the requirements of the poor, as well as for the better classes of the inhabitants. Russian manufacturers can flatter themselves that nowhere in Europe are the armies provided with better and cheaper cloth than in Russia. This manufacture of woollen felted goods should be considered all the more independent as it has a sufficiently suitable native raw material, and is in possession at the present time of an adequate supply of spindles for carded wool spinning. With regard to the fabrication of fine cloths, this branch of the industry develops comparatively slow, although lately visible progress has been made. Reverting to the manufacture of combed yarn goods it must be acknowledged that only at the present time its position is becoming more or less firm, as only for the last ten years has it had the possibility of obtaining yarn, at any rate the greater part of the amount required, of home production, through which it has acquired the right of great independence of foreign industries. For the complete success of the fabrication of combed wool goods, which gives so much hope on account of the modern condition of its qualificative element, the further development of spinning is necessary. The better this branch of Russian industry is established, the easier will it be to reach an independent position in the universal markets and the more independence will be attained by Russian sheep farming, which, with the increased home demand for wool and a suitable Government protection, will be able untiringly to develop in quantity as well as in quality.



## CHAPTER IV.

## Silk goods.

**T**HE silk goods industry is, as regards quantity, in a far less developed condition than the other branches of manufacture. This admits of an easy explanation, for although silks on account of their beautiful appearance take the first place among spun stuffs, still their high price prevents their being as much used as other fibrous materials. Most of the cotton, flax and woollen goods suffice for the everyday requirements of the population, and silks may be regarded rather as objects of luxury, only attainable by the wealthier classes, and therefore they enjoy a more limited sale.

## HISTORICAL SKETCH OF THE INDUSTRY.

Silk has been used in Russia from the earliest times. In ancient Russia various silk stuffs of eastern make, such as, brocade, purple, scarlet, damask, oksamite and others were used for holiday and state attire, as well as for sacerdotal robes, and later on, silks were imported from the west.

The gradual extension of the use of high-priced imported textile fabrics induced the Government to take steps towards establishing the industry in Russia. The first silk-weaving factories date from the time of Peter the First, for in 1714 several establishments for making brocades, velvet, silks and various light stuffs sprang up. These first manufacturers soon found many imitators and the silk industry, as a village trade, began to spread through the governments of Moscow, Vladimir and Yaroslavl. In 1809 the total number of factories rose to 194, of which 175 were in the government of Moscow; they contained 4,996 looms and employed about 9,500 hands. The output amounted to 7,110,000 arshines, and 505 pieces of various silk, 400,000 arshines of ribbon, 6,400 pieces of lace, and 12,600 pairs of gloves and stockings. During the war of 1812 the number of silk-weaving establishments in Moscow dwindled to 105, but the trade rose briskly after the war and in 1818 the number of

factories had increased to 210. In 1823 Jacquard looms were first introduced into the Russian factories, as in 1822 the Department of Manufactures and Internal Trade published the drawings and description of these looms and shortly afterwards one was exhibited in Moscow at the house of the Committee for supplying soldiers cloth. They began to spread widely in 1825; and in 1830 they were in use in many of the smaller factories; they were similar to those used in Lyons, Berlin and Vienna. This circumstance at once gave considerable impetus to the silk-weaving trade, greatly increasing the production, variety and excellence of the goods, so that the average for the period between 1826 and 1829 was about 5,000,000 arshines and 115,000 pieces of silk. In 1845 the value of the product of all the silk mills was 6,000,000 roubles, and in 1850 it rose 6,500,000 millions.

The further gradual development of the silk-weaving industry may be partly gauged by the amount of silk imported and worked up in the Russian mills. The following table gives the average import through the European frontier for periods of five years from 1855 to 1879:

| YEARS.              | Raw silk.  | Twisted and spun silk. |
|---------------------|------------|------------------------|
|                     | IN POUNDS. |                        |
| 1855—1859 . . . . . | 1,690      | 6,106                  |
| 1860—1864 . . . . . | 794        | 6,255                  |
| 1865—1869 . . . . . | 2,891      | 8,140                  |
| 1870—1874 . . . . . | 1,926      | 14,934                 |
| 1875—1879 . . . . . | 1,541      | 19,700                 |

This progressive increase of the import of raw material, caused by the rise of the internal production, was not accompanied by a decrease in the import of foreign stuffs, as is shown by the mean yearly import value of silk and half-silk goods for the same periods, also through the European frontier.

|                     |                    |
|---------------------|--------------------|
| 1855—1859 . . . . . | 6,172,000 roubles. |
| 1860—1861 . . . . . | 4,087,000 »        |
| 1865—1869 . . . . . | 4,869,000 »        |
| 1870—1874 . . . . . | 5,920,000 »        |
| 1875—1879 . . . . . | 4,244,000 »        |

Thus, although the production greatly developed, still at the same time, the demand for silk goods was so great that the home manufacturers were unable to satisfy it.

Having briefly dealt with the history of the development of the Russian silk-weaving trade a more or less detailed investigation of its condition during the last fifteen years, should be considered.

## THE IMPORT AND EXPORT OF SILK GOODS.

Although Russia does not come last among the countries of Europe in the annual production of cocoons, the process of unwinding them for obtaining the raw material and the preparation of the latter by twisting and reeling, are but little developed. The Russian silk industry, according to the last revision of the tariff, uses considerably more foreign than native material, the principal kinds being Milan, Turin, Chinese, Central Asiatic or Margellan, Kokhand and Kashgar, Circassian and Persian silk. In general the Russian material is by no means equal to the foreign both as regards purity and uniformity; and in addition to this, Russian silk is not to be had lower than 50 deniers and the principal kinds required for silk weaving are organzine and tram of 22 to 28 deniers, the number of silk thread being determined by the weight of a skein expressed in deniers, the old French system being 1 skein = 476 meters, and 1 denier = .05313 grms. This being the condition of the native silk culture, it is evident that recourse must be had to foreign markets.

The following table shows the large amount of foreign material imported through the European frontier.

| YEARS.    | Raw and floss silk. | Tram, organzine, sewing and combed silk. | YEARS.    | Raw and floss silk. | Tram, organzine, sewing and combed silk. | YEARS.    | Raw and floss silk. | Tram, organzine, sewing and combed silk. |
|-----------|---------------------|--|-----------|---------------------|--|-----------|---------------------|--|
|           | IN POUNDS.          |  |           | IN POUNDS.          |  |           | IN POUNDS.          |  |
| 1877. . . | 197                 | 10,030                                   | 1882. . . | 663                 | 22,988                                   | 1887. . . | 4,708               | 23,001                                   |
| 1878. . . | 2,786               | 24,604                                   | 1883. . . | 1,221               | 24,071                                   | 1888. . . | 13,216              | 26,981                                   |
| 1879. . . | 3,666               | 30,558                                   | 1884. . . | 1,073               | 22,788                                   | 1889. . . | 12,488              | 26,908                                   |
| 1880. . . | 6,385               | 24,327                                   | 1885. . . | 2,526               | 20,956                                   | 1890. . . | 13,182              | 23,639                                   |
| 1881. . . | 3,835               | 21,951                                   | 1886. . . | 3,027               | 21,816                                   | 1891. . . | 20,400              | 24,500                                   |
| Average . | 3,374               | 22,294                                   | Average . | 1,702               | 22,524                                   | Average . | 12,799              | 25,006                                   |

The value of the goods in the first column during the last five years averaged 1,782,837 roubles per annum, and if the import through the Asiatic frontier which, for the period between 1887 and 1890, averaged 12,676 pounds worth 347,873 roubles, the total import would reach 2,131,000 roubles; the value of the goods in the second column during the same period averaged 7,644,525 roubles per annum. The figures show that the import of foreign twisted silk, both organzine and tram, sewing silk and combed spun silk, was very considerable. The import increased during the specified periods although the duty was considerably raised.

The import of silk goods was more moderate and is shown by the following table which gives the amount passed through the European frontier.

|                   | SILK AND HALF-SILK STUFFS. |                            | KNITTED AND TRIMMING GOODS. |                            | TOTAL.                  |                            |
|-------------------|----------------------------|----------------------------|-----------------------------|----------------------------|-------------------------|----------------------------|
|                   | In thousands of pounds.    | Paper roubles in thousands | In thousands of pounds.     | Paper roubles in thousands | In thousands of pounds. | Paper roubles in thousands |
| 1877. . . . .     | 2.5                        | 1,465                      | 0.7                         | 162                        | 3.2                     | 1,627                      |
| 1878. . . . .     | 4.4                        | 2,528                      | 1.5                         | 381                        | 5.9                     | 2,909                      |
| 1879. . . . .     | 4.5                        | 2,595                      | 1.8                         | 453                        | 6.3                     | 3,048                      |
| 1880. . . . .     | 4.8                        | 2,797                      | 2.7                         | 649                        | 7.5                     | 3,446                      |
| 1881. . . . .     | 3.1                        | 1,756                      | 2.3                         | 483                        | 5.4                     | 2,239                      |
|                   |                            |                            | Average . . .               |                            | 5.7                     | 2,654                      |
| 1882. . . . .     | 3.2                        | 1,803                      | 1.8                         | 379                        | 5.0                     | 2,187                      |
| 1883. . . . .     | 3.3                        | 1,857                      | 1.7                         | 337                        | 5.0                     | 2,194                      |
| 1884. . . . .     | 3.4                        | 1,933                      | 1.6                         | 301                        | 5.0                     | 2,234                      |
| 1885. . . . .     | 3.4                        | 1,733                      | 1.2                         | 222                        | 4.6                     | 1,955                      |
| 1886. . . . .     | 2.9                        | 1,353                      | 1.2                         | 236                        | 4.1                     | 1,589                      |
|                   |                            |                            | Average . . .               |                            | 4.7                     | 2,032                      |
| 1887. . . . .     | 2.5                        | 1,174                      | 0.9                         | 193                        | 3.4                     | 1,367                      |
| 1888. . . . .     | 2.2                        | 1,113                      | 1.0                         | 231                        | 3.2                     | 1,344                      |
| 1889. . . . .     | 3.1                        | 1,527                      | 1.3                         | 294                        | 4.4                     | 1,821                      |
| 1890. . . . .     | 3.2                        | 1,419                      | 1.5                         | 320                        | 4.7                     | 1,739                      |
| 1891. . . . .     | 2.5                        | 1,134                      | 1.0                         | 234                        | 3.5                     | 1,368                      |
| Average . . . . . | —                          | —                          | —                           | —                          | 3.8                     | 1,528                      |

Besides the above mentioned goods, wax cloth and oilskin made of silk are also imported, as well as printed foulards, but in very limited quantities. The second period shows a decrease of 18 per cent below the first, and the third a decrease of 20 per cent below the second.

The export from Russia principally consists of cocoons, raw silk, and waste from the process of unwinding. The following table shows the amount exported through the European frontier of late years.

|                                 | Cocoons.     | Waste. | Raw silk. | Total. | Manufactured silk. |
|---------------------------------|--------------|--------|-----------|--------|--------------------|
|                                 | P O U N D S. |        |           |        |                    |
| Average per 1869—1877 . . . . . | —            | —      | —         | 36,466 | —                  |
| » » 1878—1887 . . . . .         | 1,026        | 4,113  | 11,289    | 15,505 | 47                 |
| » » 1888 . . . . .              | —            | 1,401  | 968       | 2,369  | 13                 |
| » » 1889 . . . . .              | —            | 7,113  | 787       | 7,900  | 14                 |
| » » 1890 . . . . .              | 285          | 7,443  | 3,284     | 10,756 | 1                  |
| » » 3 years . . . . .           | 95           | 5,319  | 1,679     | 7,008  | 6                  |

In the total the cocoons have been reduced to raw silk by taking 10 per cent of their weight; the same has been done in the succeeding table. Besides this there is a considerable export through the Asiatic or Transcaucasian frontier, as shown in the next table.

|                                    | Cocoons.     | Waste. | Raw silk. | Total  |
|------------------------------------|--------------|--------|-----------|--------|
|                                    | P o u n d s. |        |           |        |
| Yearly average 1878—1887 . . . . . | 21,184       | 6,494  | 3,868     | 12,480 |
| 1888. . . . .                      | 6,060        | 7,038  | 1,020     | 8,664  |
| 1889 . . . . .                     | 7,712        | 16,291 | 3,980     | 21,042 |
| 1890 . . . . .                     | 7,952        | 12,948 | 3,474     | 17,217 |
| Three-year average . . . . .       | 7,241        | 12 092 | 2,825     | 15,641 |

The mean value of the export during the last three years was about 500,000 roubles through the European frontier, and 1,550,000 roubles through the Asiatic. The export of silk stuffs for the period between 1888 and 1890 has averaged about 1,400 pounds per annum, to the value of 554,000 roubles. The total amount therefore is, on the average, about 2,600,000 roubles a year.

On comparing the value of the import, 11,300,000 roubles, with that of the export, it is found that the former is 4.33 times that of the latter; it must however be recollected that the foreign goods are imported principally in the state of raw material, or half-finished, as twisted silk. The import of silk stuffs does not in any case amount to more than 7 or 8 per cent of the value of the native production, and may therefore be considered very small. Notwithstanding the good quality of the Russian silk goods, they come into severe competition with those of Lyons where the silk-weaving industry has attained a remarkable degree of perfection, both from a technical and an artistic point of view, so that the import of fashionable French silks, in spite of the high duties, must be regarded as inevitable.

The following table, compiled from data of the Department of Trade and Manufactures, shows the silk-weaving production, including ribbons, during latter years:

|                |                   |                |                    |
|----------------|-------------------|----------------|--------------------|
| 1880 . . . . . | 9,129,000 roubles | 1885 . . . . . | 10,193,000 roubles |
| 1881 . . . . . | 10,526,000 »      | 1886 . . . . . | 12,451,000 »       |
| 1882 . . . . . | 11,389,000 »      | 1887 . . . . . | 12,107,000 »       |
| 1883 . . . . . | 10,509,000 »      | 1888 . . . . . | 13,637,000 »       |
| 1884 . . . . . | 10,067,000 »      | 1889 . . . . . | 13,911,000 »       |

The production of brocades and galloons, which also should be added to this, in 1889 amounted to 2,060,000 roubles.

These figures cannot however be regarded as being quite accurate as they only show the returns of the large factories, omitting those of many small silk-weaving mills, which if taken together form a considerable item. These small mills are mostly situated in the governments of Moscow and Vladimir and the region near the Vistula, and their production, taken from reliable sources, amounts to about 5 to 7 million roubles per annum, bringing the total production to about 20 million roubles.

The production of silk stuffs is evidently developing gradually, in spite of its dependence upon foreign industry for the necessary material, such as raw and twisted silk. The total number of looms occupied in weaving silk, half-silk and brocade stuffs is 12,449, and 21,898 hands are employed.

The commercial aspect of the silk industry is shown by the annexed table, which gives the price of raw materials and the cost of manufacturing them into goods.

| MOSCOW EXCHANGE PRICES IN POUNDS. |           |         |           |          |          |
|-----------------------------------|-----------|---------|-----------|----------|----------|
|                                   | Milanese. |         | Bokharan. | Nuhinsk. | Kokhand. |
|                                   | Warp.     | Weft.   |           |          |          |
| R O U B L E S.                    |           |         |           |          |          |
| 1878. . . . .                     | 525—575   | 460—485 | 205—215   | 200—210  | —        |
| 1879. . . . .                     | 510—560   | —       | 210—215   | 200—210  | —        |
| 1880. . . . .                     | 470—530   | 400—425 | 218—220   | 180—190  | 180—190  |
| 1881. . . . .                     | 460—525   | 420—450 | 180—190   | 185—195  | 160—165  |
| 1882. . . . .                     | 470—540   | 440—460 | 190—195   | 170—180  | 130—175  |
| 1883. . . . .                     | 420—485   | 390—450 | 200—218   | 175—180  | 100—190  |
| 1884. . . . .                     | 430—510   | 380—430 | 200—220   | 160—185  | 100—180  |
| 1885. . . . .                     | 390—430   | 340—410 | 170       | 140—160  | 190—205  |
| 1886. . . . .                     | 430—480   | 420—450 | 170—185   | 165—190  | 140—180  |
| 1887. . . . .                     | 450—520   | 425—475 | 225—250   | 205—230  | 225—250  |
| 1888. . . . .                     | 440—490   | 430—470 | 240—245   | 210—215  | 240—245  |
| 1889. . . . .                     | 370—430   | 370—390 | 170—175   | 150—165  | 185—195  |
| 1890. . . . .                     | 370—440   | 370—390 | 160—175   | 155—170  | 180—195  |
| 1891. . . . .                     | 325—375   | 290—340 | 150—170   | —        | —        |

In estimating the above mentioned data it is interesting to compare them with the prices of foreign silk, as given in the next table, from statistics of J. Testenoire, Directeur de la Condition Publique, referring to the Lyons silk-weaving industry; the prices are given in paper roubles per pound.



|               | O R G A N Z I N E.                     |   |   | T R A M.                                |                                    |
|---------------|--|---|---|---|------------------------------------|
|               | French 1st<br>quality silk<br>22/28 d. | Piedmontese<br>1st quality<br>silk 22/28 d. | Italian<br>2nd quality<br>silk 22/28 d. | Italian<br>2nd quality<br>silk 22/28 d. | Chinese<br>1st and 2nd<br>40/45 d. |
| 1878. . . . . | 468—480                                | 441—450                                     | 396—412                                 | 372—384                                 | 330—348                            |
| 1879. . . . . | 480—510                                | 456—480                                     | 432—444                                 | 320—432                                 | 324—336                            |
| 1880. . . . . | 414—426                                | 408—420                                     | 372—384                                 | 360—372                                 | 306—318                            |
| 1881. . . . . | 468—480                                | 444—456                                     | 360—420                                 | 396—402                                 | 354—366                            |
| 1882. . . . . | 414—426                                | 414—426                                     | 390—396                                 | 372—384                                 | 336—342                            |
| 1883. . . . . | 390—396                                | 384—396                                     | 348—360                                 | 342—354                                 | 336—348                            |
| 1884. . . . . | 378—390                                | 372—384                                     | 336—348                                 | 330—342                                 | 270—282                            |
| 1885. . . . . | 384—390                                | 384—390                                     | 354—360                                 | 348—360                                 | 276—300                            |
| 1886. . . . . | 396—402                                | 396—402                                     | 372—378                                 | 366—372                                 | 312—324                            |
| 1887. . . . . | 360—372                                | 360—366                                     | 342—354                                 | 336—348                                 | 282—300                            |
| 1888. . . . . | 370—362                                | 372—384                                     | 342—354                                 | 336—348                                 | 294—312                            |

By comparing the prices of Italian silk at Moscow and Lyons it is evident that the French silk-weaving trade is able to procure the necessary material at a far lower price.

As regards quality the Russian mills have of late years been manufacturing great varieties of pure silk and half-silk goods, such as faille, satinet, surat, satin, bursa, taffetas, moiré, matelassé, damassé, plain and figured velvet, plush, broché, handkerchiefs, coverlets, furniture stuffs, umbrella silks, ribbons, and brocades in various qualities from the cheapest to the most expensive, and in no way inferior to French goods. The smaller mills generally confine themselves to the medium and low quality, cheap goods. In conclusion it may be observed that the quantity of silk produced in Russia is not by any means as large as could be desired. Its further development was much hindered by the necessity of using high price foreign material.

The Government has now raised the duty on twisted silk and taken measures for establishing the silkworm industry, the unwinding of cocoons and silk-throwing business on a more rational basis, so that every hope may be entertained that the Russian silk-weaving trade will, in all its branches, soon attain the same degree of independence, enjoyed by the other native manufacturing industries. If the quantity produced is not at present adequate there is at all events nothing to be said against the quality, as many native silk stuffs are quite equal to those of Lyons and compete successfully with them in the Russian market, and in addition to this, there is one branch of the trade in which Russia is unrivalled, namely the manufacture of brocades, which have attracted great attention at the foreign exhibitions on account of their high artistic merit.

The following table shows the cost of manufacturing certain kinds of silk goods:

| DENOMINATION, DIMENSIONS<br>AND WEIGHT OF PIECE.                        | M A T E R I A L S A N D T H E I R C O S T.  |   | WORKING<br>COST PER PIECE. | TOTAL COST. |              |      |
|---|---|---|----------------------------|-------------|--------------|------|
|   | W A R P.  | W E F T.  |                            | Per piece.  | Per arshine. |      |
| Failla gros grain 104 arshines<br>by 13 vershoks: 13 lbs. 84 zolotniks. | Boiled organzine 6040 threads<br>plain black and 240 double<br>yellow for edges, 6 lbs. and<br>3% loss:<br>43 roubles 47 kopecks. | Limp tram, black, triple, 20<br>throws to 1 centimeter 7 lbs.<br>84 zolotniks, 8% loss. . . . .<br>32 roubles 61 kopecks. | 11.52                      | 17.52       | 105.12       | 1.11 |
| Lyons satinet 103 1/2 arshines<br>by 13 vershoks. 15 lbs. 12 zolotniks. | Boiled organzine 1760 plain<br>black threads 240 double white<br>for edges: 7 lbs 3% loss:<br>54 roubles 8 kopecks.               | Limp tram, black, triple, 27 to<br>1 centimeter 8 lbs. 12 zolotniks<br>8% loss. . . . .<br>38 roubles 3 kopecks.          | 15.94                      | 21.61       | 129.66       | 1.95 |
| Satin 60 arshines by 26 vershoks. 20 lbs. 48 zolotniks.                 | Organzine 26—28 d. boiled<br>and dyed 5 1/2 lbs:<br>68 roubles 75 kopecks.  | Twisted cotton yarn № 120/3<br>quadraple 15 lbs. . . . .<br>24 roubles 50 kopecks.  | 31.95                      | 25.04       | 150.24       | 2.50 |
| Push 31 1/2 arshines. 10 lbs.<br>44 zolotniks.                          | Organzine 38 d. for nap,<br>4 lbs. 86 zolotn. twisted cotton.<br>Yarn for body № 6 1/2 1 lb. 64 zol:<br>53 roubles.               | Twisted cotton yarn № 40/2<br>3 lbs. 86 zol. . . . .<br>2 roubles 76 kopecks.   | 36.65                      | 18.48       | 110.90       | 3.52 |
| Brocatei 50 arshines by 26<br>vershoks. 37 lbs. 53 zolotniks.           | Organzine 24—26 d.<br>Gendarme colour:<br>6 lbs. 83 zol.<br>86 roubles 90 kopecks.  | Limp tram two coloured 7 lbs.<br>5 zol. . . . .<br>Flax yarn № 14.<br>23 lbs. 61 zol.<br>52 roubles 88 kopecks.           | 65.85                      | 43.69       | 216.12       | 5.24 |

R O U B L E S.

## CHAPTER V.

## Paper Industry

**I**N early times in Russia parchment was used for writing purposes, but as this material was expensive other cheaper substitutes were tried, such as bast and birch bark, particularly the latter. Writing paper made its appearance from the east in the fourteenth century; it was made of cotton. The Tartar and Kalmuck charters, and also the most ancient book, date 1371, were written on this kind of paper. The manufacture of paper dates from the time of Ivan the Terrible, when one paper mill was built. During the reign of Alexis Michailovich there were already two, but the paper produced was of inferior quality, and therefore foreign paper was still in vogue.

Peter the Great placed the paper-making industry on a firmer footing. Experienced paper makers were invited from abroad; a Government paper mill was built in Moscow and young men were sent to other countries to study the industry. When the capital was transferred to St. Petersburg a second Government mill was built in the vicinity, called the Doudourovsk Manufactory; a decree was issued for rag-collecting and the price was fixed at 8 half-kopeks per pound. After the death of Peter the Great there were but four paper mills, but this number was gradually increased. During the reign of Anna Ioannovna a mill was built at Krasnoe Selo for supplying the Government offices with stamped paper. The Empress Catherine II decreed that all law courts were to use in preference paper of Russian manufacture; this considerably assisted the development of the paper-making trade, and the number of mills rapidly increased. In 1765 there were 13 mills; in 1766 there were 23, and in 1780 there were 25, producing 150,000 roubles worth of paper. At the beginning of this century the number further increased to 64. In 1812 the Tsarskoe Selo mill was superseded by the Imperial State Paper Manufactory, established in St. Petersburg. In 1814 the number of mills rose to 74. The technical progress achieved was however small in spite of the increasing number of mills; the change from hand-made to machine-made paper, which created a thorough revolution in the paper-making trade, was already

introduced in Western Europe at the commencement of the present century, but only penetrated into Russia after 1815.

The Emperor Alexander I. being desirous of introducing the latest improvements of the trade into Russia, ordered a mill to be built which might serve as a model for others. This led to the establishment of the Imperial Peterhov Paper Manufactory in 1817, and the first continuous paper-making machines were used there, instead of the hand process. The first results were however disastrous both from a technical, and more especially from a commercial point of view, on account of the mismanagement and extravagance of the foreign director, Mr. Westinghausen. The mill was therefore given over to the Crown, and Kazin was appointed director. The aspect of affairs soon changed, and during the six subsequent years 1,230,000 roubles clear profit were realised, and the paper was of high quality. The design of the Government in establishing this mill was not only to make it a model for other manufacturers, but also to check the sale of foreign paper in Russia, and to sell paper abroad. Unfortunately the price of the Peterhov paper, in spite of its good quality, was high, and out of the reach of most consumers. This fact, combined with the development of the private mills, led to the closing of the Peterhov Manufactory in 1849. The progress of civilization and the efforts of the Government led to continued increase in the number of private mills, and from 1816 to 1841 the import of writing paper from abroad was forbidden. The tariff of 1841, although it again permitted the import of paper, named the almost prohibitive duty of 55 kopecks per pound. The tariffs of 1850 and 1857 reduced the duty to 5 roubles per pound.

The greater number of the mills adhered to their former processes of manufacture, and but few of them adopted any improved methods, some however began to use the horizontal continuous paper-making machines. Gagarin in the Government of Yaroslav, and Menschikov and Ousatchev in Moscow, introduced this important improvement in 1837, and the success and commercial advantages of this important innovation were soon felt and appreciated by most paper makers. In 1850, out of the 159 mills producing 3,225,000 roubles worth of paper, 29 were using continuous paper-making machines and producing 2,000,000 roubles worth of paper, or about 62 per cent of the total amount.

The following figures will convey some idea of the progress of the Russian paper-making industry from its commencement until 1884. This table clearly shows that under the influence of the measures taken by Peter the Great and kept up during the subsequent reigns, and also in consequence of the advance of civilization, the number of paper mills gradually increased and especially developed between 1830 and 1862, on account of the introduction of paper-making machines which superseded the old manual process. During this space of thirty-two years the production increased nearly 60 per cent, but after 1862, judging from the number of mills, it began to decline. After 1850 the production of the mills, given in roubles, is stated, and this is more reliable than the number of mills. The history of paper making is similar to that of many other branches of industry, the progressive improvement of machinery is the same, more efficient and more productive methods are adopted, requiring the expenditure of large sums of money, and therefore necessitating considerable working capital. This is not within the reach of all mill owners, and many

| PERIOD.                       | NUMBER OF MILLS. | YEARLY PRODUCTION IN ROUBLES. | NUMBER OF HANDS. |
|-------------------------------|------------------|-------------------------------|------------------|
| Ivan the Terrible . . . . .   | 1                | —                             | —                |
| Alexis Michailovich . . . . . | 2                | —                             | —                |
| Peter I . . . . .             | 4                | —                             | —                |
| 1765 . . . . .                | 13               | —                             | —                |
| 1766 . . . . .                | 23               | 150,000                       | —                |
| 1804 . . . . .                | 61               | —                             | —                |
| 1820 . . . . .                | 87               | —                             | —                |
| 1830 . . . . .                | 104              | —                             | —                |
| 1850 . . . . .                | 159              | 3,225,000                     | —                |
| 1856 . . . . .                | 161              | 3,661,314                     | —                |
| 1862 . . . . .                | 165              | 5,682,172                     | 12,280           |
| 1870 . . . . .                | 137              | 6,095,303                     | —                |
| 1879 . . . . .                | 126              | 9,568,000                     | 10,890           |
| 1880 . . . . .                | 136              | 10,876,000                    | 11,510           |
| 1881 . . . . .                | 139              | 13,677,000                    | 11,719           |
| 1882 . . . . .                | 134              | 12,451,000                    | 12,339           |
| 1883 . . . . .                | 131              | 14,217,000                    | 12,358           |
| 1884 . . . . .                | 140              | 14,697,000                    | 13,304           |

are compelled to close their mills, while the production of the others, who have been able to improve their mills, rapidly increases. In tracing the development of the trade from 1862 to 1883 it is noticeable that the number of mills gradually decreased from 165 to 131, but during the same period the production rose from 5,333,333 to 14,200,000 roubles. In general the progress of the paper-making trade was systematic, even uninterrupted and comparatively rapid, thanks to the protective duties.

The price of paper varies from 3 to 16 roubles per pound. At present the usual prices are: wrapping paper, 3 roubles per pound; unbleached writing paper, 6.61 roubles; the same half-bleached, 7.25 roubles; the same bleached, about 8.50; bleached and glazed, about 9.25 roubles; the vergé, 11 to 14 roubles. At these prices a duty of 3.95 roubles in gold, or about 6 roubles paper money, is practically prohibitive for the medium and lower qualities, so that the higher qualities alone are imported.

The above data refer to paper mills producing various kinds of paper; the other goods manufactured in special mills, and also their production, are enumerated in the next table.

|                      | NUMBER OF<br>MILLS. | ANNUAL PRO-<br>DUCTION IN<br>ROUBLES. | NUMBER OF<br>HANDS. |
|----------------------|---------------------|---------------------------------------|---------------------|
| Wall paper factories |                     |                                       |                     |
| In 1879. . . . .     | 25                  | 1,086,000                             | 1,163               |
| " 1884. . . . .      | 27                  | 1,216,000                             | 1,209               |
| Various paper wares  |                     |                                       |                     |
| In 1879. . . . .     | 28                  | 2,270,000                             | 1,263               |
| " 1884. . . . .      | 44                  | 2,602,000                             | 1,817               |
| Wood-pulp mills      |                     |                                       |                     |
| In 1879. . . . .     | 7                   | 200,000                               | 93                  |
| " 1884. . . . .      | 26                  | 603,000                               | 391                 |

In addition to this the following data are appended which refer to the paper-making trade in Poland.

|                                | NUMBER OF<br>MILLS. | YEARLY PRO-<br>DUCTION<br>IN ROUBLES. | NUMBER OF<br>HANDS. |
|--------------------------------|---------------------|---------------------------------------|---------------------|
| Paper mills                    |                     |                                       |                     |
| In 1879. . . . .               | 37                  | 1,086,000                             | 1,076               |
| " 1884. . . . .                | 27                  | 1,919,000                             | 1,891               |
| Wall papers and coloured ditto |                     |                                       |                     |
| In 1879. . . . .               | 6                   | 143,200                               | 182                 |
| " 1884. . . . .                | 4                   | 190,000                               | 232                 |
| Various wares made of paper    |                     |                                       |                     |
| In 1879. . . . .               | 4                   | 110,000                               | 85                  |
| " 1884. . . . .                | 4                   | 48,000                                | 65                  |

These tables show that in Russia, exclusive of Finland, there were in 1884, 167 regular paper mills manufacturing paper and cardboard of various kinds; these mills employed 15,195 hands, contained 135 paper-making machines and had an annual production of 16,616,000 roubles. If the wall-paper mills and the factories of miscellaneous paper goods be added, the total number amounts to 270, employing 18,909 hands with a yearly production of 21,275,000 roubles. If the export and import of paper be compared to these figures it is found that in 1884 the import of 2,135,435 roubles is about 10.26 per cent, and the export of 165,361 amounts to 0.79 per cent of the internal production.

During 1885 and the subsequent years the paper trade with some few fluctuations continued to increase, and is shown by the following figures, which in 1888 include the production of Finland, no other yearly returns of the industry of that country being available.

|                                       | PERIOD. | NUMBER OF MILLS. | YEARLY PRODUCTION IN ROUBLES. | NUMBER OF HANDS. |
|---------------------------------------|---------|------------------|-------------------------------|------------------|
| Russia in Europe and Poland . . . . . | 1885    | 164              | 16,365,000                    | 15,958           |
|                                       | 1886    | 157              | 15,817,000                    | 15,838           |
|                                       | 1887    | 152              | 16,501,000                    | 15,478           |
| European and Asiatic Russia. . . . .  | 1888    | 155              | 16,849,000                    | 16,263           |
| Finland . . . . .                     | "       | 9                | 2,957,000                     | 1,721            |
| European and Asiatic Russia. . . . .  | 1889    | 161              | 17,908,000                    | 17,402           |

These figures show that the annual production, which in 1885 amounted to 16,333,333 roubles, gradually increased, until in 1889 it almost reached 18,000,000 roubles, or 20,000,000 together with Finland. The number of mills decreases as the total production increases; in 1885 there were 164; in 1887 this figure decreased to 152 but afterwards again rose to 161 in 1888.

The wall paper trade also made progress during the same period, although experiencing some considerable fluctuations.

|  | PERIOD. | NUMBER OF MILLS. | YEARLY PRODUCTION IN ROUBLES. | NUMBER OF HANDS. |
|--|---------|------------------|-------------------------------|------------------|
| Wall paper trade in Russia in Europe and Poland. . . . . | 1885    | 22               | 1,219,000                     | 1,292            |
|  | 1886    | 26               | 1,163,000                     | 1,347            |
|  | 1887    | 30               | 1,776,000                     | 1,288            |
| Russia in Europe, Asia and Poland . . . . .              | 1888    | 25               | 1,519,000                     | 1,249            |
| Finland . . . . .  | 1888    | 2                | 100,000                       | 40               |
| Russia in Europe, Asia and Poland. . . . .               | 1889    | 20               | 1,426,000                     | 1,106            |

A considerable decrease in the number of workmen is here observed; in 1885 there were 1,292 hands employed, and in 1889 only 1,106, with an increased production; this is accounted for by the more general use of machinery of a more improved type.

The application of paper, cardboard and paper pulp for manufacturing various goods has not attained that degree of importance or variety in Russia that the industry has reached in other countries, especially in America, as in this country papier-maché goods, cardboard boxes et cetera, are not so much made in factories as in the villages and with hand tools, so that they are much cheaper and in greater variety. The extent of this branch of trade is shown by the following figures.

|                       | YEARS. | NUMBER OF MILLS. | YEARLY PRODUCTION. | NUMBER OF HANDS. |
|-----------------------|--------|------------------|--------------------|------------------|
| European Russia . . . | 1885   | 45               | 2,699,000          | 1,872            |
| "    "    . . .       | 1886   | 57               | 2,733,000          | 2,410            |
| "    "    . . .       | 1887   | 58               | 2,749,000          | 2,720            |
| "    "    . . .       | 1888   | 67               | 2,234,000          | 2,713            |
| In Finland . . . . .  | "      | 70               | 128,000            | 288              |
| European Russia . . . | 1889   | 70               | 2,278,000          | 5,769            |

Workshops for book-binding are only included in the returns for Finland as in the other parts of Russia they belong to a separate guild.

These figures show that in 1885 there were 45 factories engaged in manufacturing various goods from paper, employing 1,872 hands, with a production of 2,700,000 roubles; in the subsequent years the number of factories rapidly rose to 70 in 1889, but the production did not correspond in the least to this increase in the number of manufactories; it first slightly rose until 1887 and then began to decline, falling to 2,300,000 roubles in 1889, that is, 400,000 roubles less than in 1885. This is partly due to the fact that the village industries, being assisted by the local authorities especially in the government of Moscow, furnished the market with cardboard goods cheaper than the factories, and because the latter alone were registered. A review of the yearly production shows that it increased very slowly but constantly, from 20 to 22 million roubles.

If the manufacture of wood pulp be included, the foregoing statistics of the Russian paper trade will show a further increase of 20 mills in Russia and 12 in Finland with an annual production of 697,000 roubles in Russia and 912,000 in Finland employing respectively 436 and 743 hands, so that the total returns of the Russian paper trade for 1889 will be 364 mills, employing 30 thousand hands and producing nearly 26 million roubles. The production of each mill has risen steadily since 1870. In that year the average production of 137 paper mills was 44,500 roubles; in 1879 the average of 126 paper mills was about 76,000 roubles; in 1889 the number of paper mills in European Russia rose to 208, with an average production of about 88,000 roubles.

Most of the paper mills are engaged in the manufacture of wrapping paper, paper for bags, white, gray and blue, blue packing paper, sugar and bottle paper.



The production of writing, printing, post and newspaper is more limited. Some special mills manufacture the following varieties: prescription paper for chemists, in many colours, tickets, book, telegraph, high class writing papers, so-called royal, ministerial, vellum, also cigarette paper, photographic and drawing paper, elephant, royal, Alexandrian and others.

The price of paper, according to its quality, weight, whiteness and finish, varies greatly. One pound of writing paper of the various kinds, except the very high qualities, such as royal and ministerial, Nos. 1 to 8, costs at the mill about 4.60 to 10 roubles, and printing paper from 4 to 6 roubles per pound.

Almost all Russian paper is sized with vegetable or rosin size, animal size being only used in the Imperial State Paper Manufactory, and a very few private mills, for some special kinds of paper for executing special orders. The Troitzk-Kondyrevsk mill and that of Vargounine Bros. use it for making the paper for card manufacture. Vegetable parchment is made at Pallisen's mill in the government of St-Petersburg, at Poliivanov's in the government of Moscow, and at other mills.

After this preliminary survey, the paper and cardboard industry in particular should be studied. For the sake of convenience it may be divided into five districts. The first comprises the Baltic provinces; the second deals with the governments of Great Russia with the more highly developed production of the governments of Kalouga, Vladimir, Tver, Moscow Yaroslavl and Penza. The third district includes the southern and south-western governments with the more considerable production of the governments of Volhynia and Kiev. The fourth group is made up of the western governments, that of Moghilev ranking first. The fifth district comprises the governments of Poland. Out of a total of 42 governments possessing paper mills only those having a minimum production of 400,000 roubles are enumerated.

The first district leads not only in its production but also in the number of well arranged mills which it contains. The 18 paper mills in the government of St-Petersburg have 52 steam boilers, 40 steam engines with a total of 2,035 horse power and 30 turbines of 800 total horse power. They produce cardboard and paper to the value of 3,830,000 roubles, and employ 2,238 men.

The Imperial State Paper manufactory ranks first among the St-Petersburg mills and is remarkable for the excellence of its product. But as it not only manufactures paper of the highest qualities for bank notes, stamps, envelopes, deeds, bills of exchange et cetera, which are also engraved and printed in the establishment, but makes all the Government paper, it cannot be classed as a commercial undertaking and is therefore merely mentioned here, especially as its description and exhibits appear at the Columbian Exhibition at Chicago.

The paper mill of Vargounine Bros. near St-Petersburg, is one of the best; it was founded in 1840 and is called the Nevsky Mill. In 1878 it manufactured paper on three continuous paper machines to the value of 812,000 roubles. In 1889 its production further increased to 927,000 roubles and employed 367 hands. In 1891 the mill was altered and enlarged; a fourth paper-making machine was added and the number of hands increased to 560; the total horse power was 800, and the mill was capable of producing 200,000 poods, that, is 3,233 tons of paper to the value of 1,500,000 roubles. The mill has its own chapel, hospital, school for 60 children, reading room, sewing class, lodging house for 500 men and a store.

M. Pallisen founded his mill in 1881; in 1886 it was turned into a Joint Stock Company; a separate section was arranged for cellulose and shortly before 1890 the production amounted to 300,000 roubles. In 1890 and 1891 a second and a third paper-making machine were added. At present this mill has 3 steam boilers, 6 steam engines and a plant sufficient to manufacture 250,000 pounds of paper worth 1,120,000 roubles. The cellulose department has been removed to Oust-Ighora, 25,000 versts from Petersburg; it manufactures cellulose by the sulphide process and is capable of producing 130,000 pounds to the value of 380,000 roubles. This establishment has organized a savings bank which receives funds of the mill as well as from the work people. The mill hands are insured against accidents.

The Golodaev Paper Manufactory was established by M. Krylov in 1882; it produces printing paper to the value of 340,000 roubles. In 1888 it became the property of M. Basil Pechatkin, a mechanical engineer who almost entirely rearranged it; new machines were put up and more perfect processes introduced. The mill now contains 6 steam engines with a total of 460 horse power; there are two paper-making machines producing 150,000 pounds of paper to the value of 750,000 roubles, and 250 hands are regularly employed. The principal kinds of paper manufactured are the following: printing, elephant, vellum, newspaper and all kinds of ticket and album papers.

The following are some of the principal paper mills in the districts of the government of St-Petersburg: M. C. Pechatkin's mill at Krasnoe Selo, established over 100 years ago. The motive power of this mill is made up of two 30 horse turbines and 6 steam engines giving 175 horse power; 141 men are employed. There are four paper-making machines producing 41,000 pounds of foolscap, writing, newspaper and cardboard, 15,000 pounds of paper in rolls and 350,000 reels of telegraph tape. The yearly production amounts to 280,000 roubles. Messrs. C. & H. Nebe's paper mill was founded in 1839; it has two steam engines giving 155 horse power and 5 turbines yielding 335 horse power; there are two paper-making and one cardboard-making machine; 254 hands are employed and 97,500 pounds of writing paper, foolscap paper and cardboard are manufactured. The value of the annual production is 608,000 roubles. There is a school attached to this mill. Mr. C. Lindgart's mill was established in 1810. There are three steam engines with a total of 94 horse power. 70,600 pounds of writing paper, printing, albumen and wrapping paper are made; 160 men are employed and the yearly production amounts to 445,000 roubles.

There are 9 paper mills in Livonia having 11 turbines with an aggregate of 400 horse power, 16 steam boilers and 12 steam engines yielding 560 horse power. They produce paper and board to the value of 1,087,000 roubles and employ 606 men. The principal mill belongs to the Riga Paper Mill Ligat Company. It was established in 1864 and has 4 steam engines, makes 68,000 pounds of paper of various kinds selling at from 3.60 to 16 roubles per pound, the yearly production being 470,000 roubles, and 250 men are employed.

In the government of Novgorod there are 5 paper mills with 9 turbines giving 565 horse power, 17 steam boilers and 10 steam engines yielding 772 horse power and 748 hands are employed. The yearly production amounts to 685,000 roubles. The principal mill belongs to Mr. Pasburg and was established in 1863. It has only one steam engine; it manufactures 150,000 pounds of wrapping paper to the value of

250,000 roubles and employs 450 hands. There is a school and also a hospital attached to this mill.

Among the governments composing the second paper making district, that of Kalouga is the most important. It contains nine mills, the motive power being generated by 11 turbines yielding 400 horse power and 19 steam engines giving 560 horse power fed by 16 boilers. The yearly production is 1,568,000 roubles and 1,639 hands are employed. The principal mills may be described as follows: Mr. Howard's Troitsk-Konrovsk paper mill, founded in 1790 by Mr. Schepochkin in the village of Kondrova on a very large scale. The business then passed into the hands of Mr. Howard who developed it to such an extent that in 1858 there were three mills in the villages of Kondrova and Troitska. Mr. Howard then turned the affair into a Stock Company. The enterprise developed with such rapid strides that from 1880 up to the present time the average yearly production has been about 1,500,000 roubles. These mills use cellulose of their own manufacture. Various qualities of paper are made, but the principal item is 800,000 roubles worth of writing paper. There are four paper-making machines and 15 steam engines, yielding 1,200 horse power and 2 water wheels of 30 horse power. There are two village schools, one technical school and a hospital attached to the establishment.

The seven paper mills of the government of Vladimir have 15 steam boilers and 10 steam engines generating 292 horse power. The yearly production amounts to 876,000 roubles and 719 hands are employed. The principal mills are that of Protasiev founded in 1861 containing 3 steam engines of 80 horse power, producing 60,000 pouds of writing and newspaper valued at 352,000 roubles; 315 men are employed, a school and hospital being attached to the mill; Sposobin's mill, founded in 1814, containing 2 steam engines of 40 horse power, producing 70,000 pouds of writing and other kinds of paper, valued at 420,000 roubles, and employing 252 men.

In the government of Tver there are five paper mills with 5 hydraulic motors of 110 horse power, 21 steam boilers and 13 steam engines generating 684 horse power. The total production is 998,000 roubles and 1,018 hands are employed. The government of Moscow contains 16 mills having altogether 13 steam boilers and 11 steam engines giving 162 horse power. The yearly production is 472,000 roubles and the number of workmen 727. The principal mill is Mr. M. Polivanov's Writing Paper and Vegetable Parchment Company, established in 1874. It has two steam engines of 45 horse power, manufactures 50,000 reams of paper and 2,265 pouds of parchment; the total production is valued at 232,000 roubles, the number of hands being 250. The two mills in the government of Yaroslav have together 4 steam boilers and 10 steam engines with an aggregate of 234 horse power. The value of the yearly production averages 449,000 roubles and 491 men are regularly employed. The largest mill belongs to the Ouglitch Writing Paper Manufacturing Company, founded in 1735; the plant includes 7 steam engines yielding 182 horse power. The yearly production amounts to 74,500 pouds of printing, writing, wrapping paper and cardboard; the value of this output is 410,000 roubles; 368 men are employed. The two mills in the government of Pensa are supplied with motive power by 7 hydraulic motors generating 412 horse power, 5 steam boilers and 6 steam engines giving 80 horse power. The yearly production is 528,000 roubles and the number of hands 640. The best mill, founded in 1850, is owned by Sergeyeff & Co., who manufacture 135,000 pouds

of writing and other paper per annum, to the value of 670,000 roubles, the number of hands being 864.

Among the mills in the government comprised in the third, or southern group, the following may be mentioned: nine paper mills in Volhynia having 16 hydraulic motors generating 280 horse power, 17 steam boilers, 16 steam engines giving altogether 505 horse power, 589 hands employed, yearly production 563,000 roubles; three mills in the government of Kiev with 12 steam boilers and 13 steam engines supplying 400 horse power; their yearly production amounts to 541,000 roubles in value. In consequence of the large trade done in beet sugar very many small mills make only sugar paper.

In the government of Mogiliev belonging to the fourth, or western group, there are three paper mills; these are supplied with power from 4 hydraulic motors generating 420 horse power, 7 steam engines furnishing 464 horse power being in use; their yearly production is worth about 918,000 rouble. The most considerable mill belongs to the Dobroushk Company, established in 1871 by Prince Pashkevich; shortly before 1880 this mill produced wrapping and cheap writing and printing paper to the value of 250,000 roubles. In 1878 the business was turned into the hands of a Stock Company, and under the management of the mechanical engineer, Mr. Stoulchinsky. The mill was in a short space of time much altered and enlarged; 2 new turbines of 350 horse power and 2 steam engines yielding 500 horse power were put up, and all the paper-making plant was much improved. Many notable additions were also made, such as a fitting and repairing shop, a mill capable of manufacturing 160,000 pounds of straw stuff, a wood-pulp mill, caustic soda and alkali works and a railway branch line, four an one-half versts long, with rolling stock. The mill is lighted by electricity and the production increased to 195,000 pounds of writing, printing, telegraph and other paper to the value of 980,000 roubles; 550 hands, including 200 women are employed. There are an apothecary shop, doctor, surgeon, school, general store, savings bank and pension fund attached to this establishment.

The fifth group is made up of the governments of Poland, that of Warsaw being far the most important. Four of the mills in this government have 6 hydraulic motors, 8 steam boilers and 6 steam engines giving 268 horse power; their yearly production amounts to 930,000 rouble, and they employ 1,252 men. One of the largest mills belongs to the Soshevka Paper-making Company; its motive power consists of 4 hydraulic motors and 3 steam engines, supplying altogether 396 horse power; it manufactures writing and wrapping paper, and cardboard to the value of 470,000 roubles per annum and employs 500 men. The ten paper mills in the government of Petrokov are driven by 5 hydraulic motors generating 99 horse power, 15 steam boilers and 14 steam engines furnishing 312 horse power. Their total production has a value of about 744,000 roubles, and 568 men are employed. There are two paper manufactories in the government of Kelets supplied by 3 hydraulic motors generating 115 horse power, 6 steam boilers and 4 steam engines of 130 horse power in all. Their yearly production is about 430,000 roubles and 400 men are employed. There are also two paper mills in the government of Kalish, driven by 3 turbines generating 122 horse power, 4 boilers and 5 steam engines whose united horse power is about 185. Their total production has a value of 421,000 r., and they employ 410 men.

Having briefly described the paper and cardboard manufactories, the wall paper trade, which is more or less centred in the governments of Poland, St. Petersburg and Moscow, may be next considered.

In the government of St-Petersburg there are six mills occupied in manufacturing wall paper; their motive power is derived from 5 steam boilers and 5 steam engines producing 48 horse power. Their yearly production has a value of 708,000 roubles, and they employ 417 hands. The principal mills are that of by Camuset & Co., established in 1841, and which has one 10 horse power steam engine and manufactures 435,000 pieces costing 104,000 roubles, 100 men being regularly employed; and that of the Oukonine Wall-paper Manufacturing Co., at Tsarskoe Selo, acquired from the government in 1858, driven by one 12 horse power engine, yearly production being valued at 145,000 roubles, with 111 hands.

Nine mills in the government of Moscow have altogether 4 steam boilers and 3 steam engines with 71 total horse power; their united yearly production is valued at about 494,000 roubles, there being 557 men engaged in the trade. The largest factory belongs to Mr. Krotov, founded in 1868; it is driven by one 16 horse engine and manufactures 10,000 pieces per day, the yearly production reaches 240,000 roubles and 200 hands are employed.

In Poland there are three mills carrying on the manufacture of wall-papers to the yearly value of 178,000 roubles and giving work to 94 men; their plant includes 2 steam boilers and two 20 horse power steam engines. There are also many factories where the manufacture of divers objects made of paper is carried on, but they are principally situated in the governments of Moscow and St.-Petersburg. In the former district there are 16 of these mills, one of which possesses a steam boiler and one 8 horse power steam engine. The total yearly production of these mills is 862,000 roubles and 2,611 men are engaged therein. The largest mill belongs to Mr. A. Victorson and was established in 1873; it manufactures 350 million cigarette tubes worth 120,000 roubles, and employs only 15 men.

In the government of St.-Petersburg there are 17 of these factories, having altogether 5 steam boilers and 4 steam engines yielding 65 horse power; they employ 1,477 hands and their yearly production is valued at 772,000 roubles. The largest of these mills is owned by the Foundling Hospital and Institute, under the patronage of the Imperial Family. This establishment possesses the exclusive privilege of manufacturing playing cards, all the profits being devoted to the education of destitute orphan children. The mill is driven by two 55 horse power steam engines and the plant comprises 15 platen printing presses and 11 glasing rolls. The yearly production is 400,000 dozen packs of playing cards valued at 1,680,000 roubles, and employing 314 men. The balance sheets of this establishment quote the working expenses at 374,000 roubles per annum.

#### IMPORT OF PAPER.

In spite of the development of the Russian paper-making trade, it is not yet in a position to supply the home demand as the import of foreign paper still continues to increase. From 1870 to 1880 the importation of paper has increased from

899,074 to 2,065,796 roubles, as shown by the following table giving the amounts passed through the European frontier.

| VALUE OF PAPER IMPORTED. |           |                |           |
|--------------------------|-----------|----------------|-----------|
| YEARS.                   | Roubles.  | YEARS.         | Roubles.  |
| 1870 . . . . .           | 899,047   | 1876 . . . . . | 2,412,385 |
| 1871 . . . . .           | 1,200,736 | 1877 . . . . . | 1,080,450 |
| 1872 . . . . .           | 1,686,805 | 1878 . . . . . | 1,751,863 |
| 1873 . . . . .           | 1,938,350 | 1879 . . . . . | 1,846,947 |
| 1874 . . . . .           | 2,117,171 | 1880 . . . . . | 2,065,796 |
| 1875 . . . . .           | 2,539,921 |                |           |

Since 1880 the import has continued in general to increase but exhibits some considerable fluctuations; thus, in 1884 the amount passed through the European frontier was valued at 2,135,435 roubles; in 1885 it rose to 5,087,544; in 1886 it declined to 2,570,106 roubles; the average for the three years was 3,271,028 roubles. The great increase in 1885 was due to sudden import of paper through the frontier of Finland to the amount of 2,900,000 roubles, whilst during the preceding years hardly any paper had been imported from Finland and in 1886 this item declined 72 per cent.

The next table shows the value of the import of paper for the subsequent years, and as in the previous table; the figures refer to the import through the western frontiers, including the border line between Finland and the other parts of the Russian Empire, as a great deal of paper comes to St. Petersburg from the Grand Duchy; the import of books, and prints is included.

| VARIETIES AND VALUE OF PAPER IMPORTED. | 1887.     | 1888.     | 1889      | 1890.     |
|--|-----------|-----------|-----------|-----------|
|  | Roubles.  | Roubles.  | Roubles.  | Roubles.  |
| Paper . . . . .                        | 1,937,721 | 1,711,364 | 2,238,026 | 2,161,480 |
| Cardboard . . . . .                    | 134,734   | 155,209   | 214,667   | 216,322   |
| Books . . . . .                        | 1,659,794 | 1,645,892 | 1,771,276 | 1,755,060 |
| Pictures and hand drawings . .         | 286,457   | 183,893   | 235,226   | 157,868   |
| Prints, engravings . . . . .           | 113,796   | 276,718   | 146,796   | 127,957   |
| Maps, music . . . . .                  | 110,410   | 136,847   | 137,560   | 128,845   |
| Wall papers and borders . . .          | 118,948   | 87,816    | 102,693   | 95,649    |
| Wood pulp and papier maché .           | 1,027,634 | 1,197,965 | 1,530,220 | 2,017,737 |
| Paper cuttings and rags . . . .        | 330,696   | 540,204   | 220,889   | 150,404   |
| Total . . . . .                        | 5,718,190 | 5,935,908 | 6,580,393 | 6,811,328 |

The first of these items is the largest, its average for the four years being valued at 2,024,295 roubles; it may be subdivided as follows: *a.* sized paper of different qualities, average for the four years, 1,022,733 roubles; *b.* unsized white and coloured paper without ornamentation, yearly average, 66,965 roubles; *c.* printing and other paper, 155,272 roubles; *d.* cigarette, chinese, wrapping and other paper, mean yearly average value, 767,176 roubles. The item entered as books, is considerable and fairly constant, being on the average worth 1,708,005 roubles; it may be subdivided into four categories as follows: *a.* books printed in foreign languages, average value of import, 1,622,730 roubles; *b.* books printed abroad in the Russian language and unbound, yearly average value of import, 6,443 roubles; *c.* the same bound, 2,898 roubles; *d.* ledgers and copy books, 75,434 roubles.

Wood pulp is imported in large quantities, and although this item fluctuates considerably, it is greatly increasing; in 1887 it was set down at 1,027,634 roubles, and in 1890 it rose to 2,017,735 roubles, or almost doubled in the space of four years, the average being 1,443,389 roubles, or about 22.5 per cent of the total import. This industry may be divided into two classes: *a.* wood pulp pressed into sheets, having the appearance of cardboard, and papier maché, average value, 623,301 roubles; the greater part of this comes from Finland which supplies on the average 599,011 roubles worth, or about 96 per cent of the whole quantity; *b.* wood pulp in any other form than sheets, and all other kinds of paper stuff or pulp, yearly average value, 802,087 roubles, Finland supplying to the amount of 633,200 roubles or about 78.75 per cent.

#### EXPORT OF PAPER GOODS.

These exports are various and may be classed as follows: 1. paper; 2. cardboard; 3. books; 4. free-hand drawings and plans; 5. prints and engravings; 6. pictures; 7. papier maché; 8. paper cuttings; 9. rags.

| VARIETIES OF PAPER EXPORTED.   | 1887.     | 1888.     | 1889.     | 1890.     |
|--------------------------------|-----------|-----------|-----------|-----------|
|                                | Roubles.  | Roubles.  | Roubles.  | Roubles.  |
| Paper . . . . .                | 167,678   | 156,803   | 180,368   | 180,122   |
| Cardboard . . . . .            | 21,171    | 22,886    | 13,004    | 4,630     |
| Books . . . . .                | 605,373   | 506,452   | 574,420   | 548,635   |
| Plans and drawings. . . . .    | 1,869     | 2,447     | 4,768     | 3,867     |
| Prints and engravings. . . . . | 9,194     | 14,638    | 23,032    | 6,597     |
| Pictures . . . . .             | 142,320   | 359,641   | 158,650   | 152,683   |
| Papier maché. . . . .          | 3,218     | 6,861     | 3,979     | 1,336     |
| Paper cuttings . . . . .       | 29,280    | 4,008     | 9,123     | 3,287     |
| Rags . . . . .                 | 855,487   | 758,904   | 619,466   | 452,776   |
| Total . . . . .                | 1,835,590 | 1,832,639 | 1,587,810 | 1,353,933 |

The above-mentioned data show that the export is small and averages 1,652,493 roubles worth per annum during the four years enumerated. A decrease is exhibited especially with regard to rags, the export of which has declined from 855,487 roubles in 1887 to 452,776 roubles in 1890, due to an increased consumption at home, to the existence of an export duty of 30 copecks per poud, and also to the temporary restriction on export from sanitary reasons. The next most important item is that of books the mean export for the four years being valued at 558,720 roubles or about 34 per cent of the whole. The average export of pictures during the stated period is 203,323 roubles or 12 per cent of the total export. The mean value of the paper exported during the period of four years is 171,242 roubles or 10 per cent of the sum total.

In conclusion, the various data which have been quoted in connection with the paper-making trade in Russia up to the commencement of 1890 may be condensed into the following figures which show the state of this industry at present:

Russia, except Finland, in 1889:

|   |                    |
|---|--------------------|
| Paper mills . . . . .   | 271                |
| Hands employed . . . . .  | 24,710             |
| Total value of production . . . . .                                     | 22,500,000 roubles |
| Average value of production . . . . .                                   | 83,059 »           |
| Value of labour per man . . . . .                                       | 901.9 »            |
| Import . . . . .  | 4,250,000 »        |
| Export . . . . .  | 500,000 »          |
| Home consumption . . . . .  | 26,000,000 »       |
| Home consumption per head counting<br>120,000,000 inhabitants . . . . . | 0.22 »             |



## CHAPTER VI.

## Leather Goods.

**T**ANNING is one of the oldest branches of Russian industry and originated in the East, spreading thence throughout the Empire. Russian carriers are already mentioned in the ancient chronicles of Nestor. Later on the tanning trade developed to such an extent that a tax was levied upon those who practised it during the reigns of Dimitri Donskoi, Basil Dimitrievich and Basil the Dark. Kazan has, from time immemorial, been the centre of this industry in eastern Russia.

When Kazan passed into the hands of the Tartars this trade still further developed on account of the great demand for morocco and other leathern goods. When the town was conquered by Ivan the Terrible the tanning trade was for a time held in check, but soon afterwards became brisker and quickly recovered itself and with greater energy than ever, established itself in the governments of Nizhni-Novgorod, Kostroma, Yaroslav, Novgorod and Pskov. The most well known product was Russia leather which has for ages been exported and sold in bales of one to one and one-half poods. During the latter half of the seventeenth century about 75,000 bales were exported from Kholmogora and Archangel. In the towns of Totma and Vologda during the winter the leather goods were stored in large warehouses ready for shipment abroad in spring. The Government took measures for fostering and developing the industry and in the reign of Peter the Great a number of decrees were issued tending to improve the manufacturing processes; carriers were engaged in foreign countries and brought over to teach the various kinds of leather dressing; numerous regulations were prescribed, and in 1716 a large Government order of 100,000 poods of Russia leather at 4 roubles per pood was given to private firms to be delivered in Archangel, where the hides were sold by the state without profit. Up to the accession of Catherine II there were 25 tanneries and 10 leather dressing works in Russia and at the end of her reign the number of tanneries had increased to 84.

The export of hides was considerable and the amount at the end of the last century was as follows:

| TOTAL AMOUNT OF LEATHER.      | 1778—1780 | 1790—1792 |
|-------------------------------|-----------|-----------|
|                               | ROUBLES.  |           |
| Goods . . . . .               | 1,049,642 | 1,493,354 |
| Russia leather. . . . .       | 1,010,288 | 1,258,106 |
| Other dressed hides . . . . . | 33,713    | 228,521   |
| Pelts . . . . .               | 6,641     | 6,727     |

Russia leather was evidently the most important item of export, and pelts the most insignificant. The wars at the commencement of the present century created a great demand for boots and other leathern goods and enormously increased the production of the leather factories. In 1804 there were 850 tanneries employing 6,304 hands, and in 1814 the number had increased to 1,530 with 7,799 hands.

The quality of the goods did not however improve with the increased production nor keep pace with the progress made abroad in this branch of industry, therefore the export soon began to decline, as shown by the accompanying figures, which give the amount passed through the European frontier in roubles.

|                               | 1814—1815 | 1820—1821. | 1824—1826. |
|-------------------------------|-----------|------------|------------|
| Total leather export. . . . . | 1,472,196 | 813,183    | 704,460    |
| Russia leather . . . . .      | 1,271,845 | 785,392    | 641,001    |
| Other hides . . . . .         | 201,351   | 27,791     | 63,459     |

The decrease in the export of dressed hides occasioned an increased export of pelts as shown by the following figures:

|                     |                |
|---------------------|----------------|
| 1802—1804 . . . . . | 81,751 roubles |
| 1814—1815 . . . . . | 149,823   »    |
| 1824 . . . . .      | 631,686   »    |

The import of leathern goods was very small and averaged about 90,000 roubles. In course of time the demand for such goods still further increased, and in 1835 there were already 1,862 tanneries; in 1850 the number rose to 2,063, employing 10,383 men with a production of 8,500,277 roubles. The greater part of this quantity was, however, the produce of small tanneries, the owners of which possess neither sufficient knowledge nor capital to improve their methods or increase their production. These defects were most apparent in the manufacture of boot soles, and partly depended upon the small necessities of the consumers and partly upon the demand for cheap goods.

The introduction of more rapid tanning processes and of other improvements in the trade, the increased competition and the import of foreign goods and likewise

the increased wants of the Commissary Department which was the largest orderer of shoe leather and other leather goods, and also the growing demand for imported straps, combined to give an impetus to the various processes of the tanning trade in Russia. More large tanneries were established; the dressing of thick boot sole leather and belting began to develop and improve, and at the same time created a demand for thick American raw hides. Most of the largest tanneries were established at about this time, namely, Brousnitzen's in 1847, Ossipov's in 1857, the Vladimir Tanning Co. in St. Petersburg in 1862, Shlenker's in 1846, and Pfeiffer's in 1854, the two latter, in Warsaw. Some of the old tanneries were enlarged and improved: Zverkov's of St. Petersburg in 1832, Shouvalov's in 1830, and Bakhroushin's in 1834, both in Moscow, Temler and Schwede's in 1819 in Warsaw, and many others. Although improvements in the trade proceed very slowly, compared with those made in other branches of industry, still a great deal of progress was made manifest at the Russian Exhibitions of 1861 and 1870, at the former there were 48 exhibitors and a very complete and various collection of leather goods was shown, some exhibits being of very high class goods. There were 60 exhibits at the Exhibition of 1870, besides half-tanned hides, Russia leather, calf leather, dressed calfskins, and morocco; some excellent samples of heavy shoe leather and belting were shown. The mechanical tanning processes and other improvements have however spread very slowly, and have only been adopted at comparatively few tanneries. The leather trade greatly extended during the period last mentioned and its production is shown by the following figures:

| YEAR.          | Number of tanneries. | Yearly production in roubles. | Number of hands. |
|----------------|----------------------|-------------------------------|------------------|
| 1856 . . . . . | 2,074                | 9,959,996                     | 11,739           |
| 1860 . . . . . | 3,410                | 16,752,427                    | 13,489           |
| 1864 . . . . . | 2,462                | 17,750,042                    | 12,927           |
| 1868 . . . . . | 2,860                | 16,865,242                    | 13,742           |
| 1870 . . . . . | 2,899                | 24,991,617                    | 14,880           |

At that time the duty on imported leather was 10 roubles per large dressed hide and 4 roubles per small; the import, although, continued to increase, the mean being as follows:

| DATE.             | Small hides. | Large hides. |
|-------------------|--------------|--------------|
|                   | In pounds.   |              |
| 1851—1853 . . . . | 1,927        | —            |
| 1859—1861 . . . . | 3,602        | 6,110        |
| 1866—1868 . . . . | 8,518        | 10,801       |

From 1870 to 1880 the production continued to increase without much improvement being made in the manufacturing processes.

| D A T E.       | Number of tanneries. | Number of hands. | Production in roubles. |
|----------------|----------------------|------------------|------------------------|
| 1871 . . . . . | 3,065                | 14,400           | 26,111,381             |
| 1875 . . . . . | 2,764                | 14,577           | 26,506,000             |
| 1879 . . . . . | 3,317                | 20,132           | 41,986,300             |

These figures show that the production in 1871 amounted to 26 million roubles, or 1,200,000 more than that of the preceding year; from that time until the end of 1877 the mean production was about 27 million roubles per annum. In 1878 it rose with a bound to 42 million, that is to say, that during the space of two years it increased 55 per cent. This sudden increase was due to a very lively demand for boots and other leathern goods during the Russo-Turkish war. The following statistics show the state of the trade during the subsequent years.

| D A T E.       | Number of tanneries. | Production in roubles. | Number of hands. |
|----------------|----------------------|------------------------|------------------|
| 1880 . . . . . | 3,563                | 42,037,000             | 20,689           |
| 1881 . . . . . | 3,566                | 37,713,000             | 20,085           |
| 1882 . . . . . | 3,525                | 37,640,000             | 19,656           |
| 1883 . . . . . | 3,551                | 38,611,000             | 19,572           |
| 1884 . . . . . | 3,179                | 38,098,000             | 19,685           |

During the first year after the war the trade was still engaged in completing the large orders given during the campaign as the operations of tanning and dressing the thick hides required for boot soles and for strapping occupy about a year, and consequently the pelts received in 1879 were only finished in 1880. In that year the maximum production of the Russian leather trade was attained. In the following year it fell to 37 million roubles, or about 10.2 per cent, and then during the three subsequent years, up to 1884 inclusive, it averaged very nearly 38 million roubles, which is about 11 million roubles or 29 per cent more than the average of the preceding ten years, excluding the two years of the Russo-Turkish war. The production during the next five years is shown by the annexed table.

| T R A D E.                               | 1885.                |                                     |                  | 1886.                               | 1887.  | 1888   | 1889.                |                                     |                  |
|--|----------------------|-------------------------------------|------------------|-------------------------------------|--------|--------|----------------------|-------------------------------------|------------------|
|  | Number of tanneries. | Production in thousands of roubles. | Number of hands. | Production in thousands of roubles. |        |        | Number of tanneries. | Production in thousands of roubles. | Number of hands. |
| Tanning . . . . .                        | 2,248                | 36,640                              | 19,032           | 39,392                              | 39,864 | 39,002 | 2,300                | 38,034                              | 21,511           |
| Leather dressing and sheepskins. . . . . | 259                  | 2,007                               | 2,144            | 1,728                               | 3,178  | 1,759  | 222                  | 1,730                               | 3,052            |
| Leather goods. . . . .                   | 46                   | 1,682                               | 1,500            | 1,607                               | 1,757  | 2,210  | 82                   | 2,224                               | 2,960            |
| Total . . . . .                          | 2,553                | 40,329                              | 22,676           | 42,727                              | 44,799 | 42,971 | 2,604                | 41,988                              | 27,523           |

The rapid increase in the number of tanneries and in their production greatly depended upon the development of some branches of the leather industry which had hardly existed before that time. For instance in former years a large quantity of horseskin shoe leather and sewn uppers had been imported under the name of Hamburg goods, and of late years the home manufacture of this article greatly spread, and by reason of its low price soon diminished the import. The following tables for 1888 and 1889 show the present condition of the tanning, leather dressing and sheepskin trades and of the production of leather goods, taken from statistics relating to the best known firms:

| LEATHER TRADE.                             | 1888.                |                                     |                  | 1889.                |                                     |                  |
|--|----------------------|-------------------------------------|------------------|----------------------|-------------------------------------|------------------|
|  | Number of tanneries. | Production in thousands of roubles. | Number of hands. | Number of tanneries. | Production in thousands of roubles. | Number of hands. |
| Russia in Europe without Finland . . . . . | 1,896                | 34,994                              | 1,811            | 1,955                | 35,510                              | 19,115           |
| The Caucasus. . . . .                      | 60                   | 1,629                               | 717              | 63                   | 410                                 | 611              |
| Siberia and Turkestan. . . . .             | 295                  | 2,379                               | 1,752            | 282                  | 2,123                               | 1,785            |
| Total . . . . .                            | 2,251                | 39,002                              | 4,280            | 2,300                | 38,043                              | 21,511           |

At the beginning of 1890 the total number of tanneries in Russia was 2,300, with a production of about 38 million roubles, and employing 21,511 men. Besides this, in Finland in 1888 there were 602 with a production of 303,000 roubles, and employing 1,903 hands.

The largest and most advanced tanneries are situated in the Baltic region, and in the government of St. Petersburg in particular. Towards the end of 1889 the

production of the 41 tanneries of this district was valued at 4,572,000 roubles and they employed 1,514 men. The largest tanneries are in St. Petersburg itself, that of Brousnitzin & Sons ranking first. This establishment was founded in 1847, when the output consisted of 4,000 hides valued at about 50,000 roubles; in 1878 the production increased to 40,000 hides or 800,000 roubles per annum. Their goods consist of thick boot sole leathers made of American pelts, belting and half-dressed hides; and by adopting the latest improvements in machinery and manufacturing processes the present production has risen to 70,000 American and Circassian hides for boot soles, belting and half-dressed hides, valued at 1,600,000 roubles. Last year these works were considerably altered and enlarged to the capacity of 90,000 hides. The works possess 4 steam boilers, two 100 horse power steam engines, as many as 1,100 various vats, many special machines and a fitting shop. They are lighted by electricity, and employ 500 hands; 450 are lodged free of charge in a model lodging house on the premises, a doctor being also provided. The workmen attend the classes of the Imperial Russian Technical Society, to which the owners largely contribute. Ossipov's tannery was founded in 1857; it has one 20 horse power steam engine and produces 50,000 boot sole and half-dressed hides to the value of 722,000 roubles and employs 180 men. Paramonov's tannery, established in 1883, and has 2 steam pumps; it produces 27,000 hides valued at 445,000 roubles and employs 95 hands.

In the central region, the Governments of Tver and especially that of Moscow are most important. The total production of these two governments in 1889 was 5,520,000 roubles, and of this 3,792,000 fell to the share of the 52 tanneries in the government of Moscow in which 2,770 men are employed, the remaining sum of 1,728,000 being the production of the 65 tanneries of the government of Tver, employing 1,222 men. The other governments of the central region contain very few large tanneries. The principal Moscow firms are: 1. Alexis Vakhroushin & Sons, established in 1834; it has one 20 horse power steam engine, dresses 259,000 goat-skins, sheepskins, calfskins and bull hides valued at 694,000 roubles, and employs 560 men; there is a free school on the premises for 200 pupils of both sexes. 2. Michael Zhemochkin & Sons, founded in 1853, driven by one 12 horse power steam engine, yearly production 18,800 boot sole, American, tanned and other hides to the value of 478,000 roubles, 215 hands; a small hospital is attached to the works. 3. John Shouvalov & Sons, established in 1830; it has two steam engines yielding 35 horse power; the yearly production is about 230,000 hides including a quantity of sheepskin and kid morocco altogether valued at 400,000 roubles; 275 men are engaged in these works. 4. Teal & Co. established in 1883, one 10 horse power steam engine, turnover 27,510 boot soles, Russia leather and tanned hides worth 400,000 roubles, about 100 men employed. 5. Malkiel's tannery, founded in 1880, one 20 horse power steam engine, yearly production of 10,000 various hides worth 750,000 roubles, 150 men employed.

These data show that the Moscow tanneries are not so large as those of St. Petersburg, and in addition, that most of them tan smaller hides which fetch lower prices. The leather trade of the government of Tver is intimately connected with the shoemaking business, which is widely spread, both as a manufacturing and as a village industry. The principal centres of the leather trade are the districts

Korchevsk and Rzhevsk and the towns of Ostashkov and Torjok. Potapenko's tannery is one of the largest; it is situated in the Korchevsk district, was founded in 1879; its yearly production amounts to 655,000 roubles, possesses one 4 horse power steam engine and employs 210 men, turning out over 60,000 hides per annum. The firm of Savine has 13 tanneries owned by different individuals in the town of Ostashkov; the yearly production of each of these does not exceed 100,000 roubles, excepting that belonging to Theodore Savine, founded in 1740 and famed for its Russia leather dressing. It possesses 3 steam engines generating altogether 52 horse power and employing 473 hands; its yearly production amounts to 116,000 hides valued at 553,000 roubles.

The governments composing the eastern and south-eastern region, and particularly those of Viatka, Perm, Kazan, Samara and Saratov, form important centres of the leather trade, both as regards the number of tanneries and their total yearly production. The separate output of each tannery in this region is however small and the large total is made up of the production of the numerous small tanneries. The mean yearly output of the tanneries of Viatka does not exceed 43,000 roubles, that of the government of Perm being only 11,000, whilst the yearly average production of the Saratov tanneries is as small as 4,700 roubles, the total number being 117, so that the whole government has a production of 554,000 roubles. The government of Viatka ranks first in importance, having 77 tanneries employing 1,780 men, the total production being 3,298,000 roubles. The largest works are in the town of Viatka, Slobodsk and Nolinsk.

The principal governments of the southern region are those of Kiev, Chernigov and Kherson; the number of tanneries and the production of the first two being almost equal, namely: in the first, 58 tanneries, with a production of 1,129,000 roubles, in the second, 62 tanneries, with a production of 1,386,000 roubles. In the government of Kiev the chief centres are the towns of Kiev, Berdichev and Smela. The district of Berdichev contains Shlenker's large tannery established in 1875; it has 2 steam engines generating 75 horse power; its yearly production amounts to 33,300 hides valued at 320,000 roubles and employs 127 men. A small hospital is attached to the works of Kobets's tannery in the neighbourhood of Kiev; it is considerably smaller, its yearly production being only 100,000 roubles; it was founded in 1845, has a 20 horse steam engine and employs 24 men; it turns out 16,500 hides per annum. Small tanneries with a production from 3,000 to 25,000 roubles predominate in the government of Chernigov. There are 16 tanneries in the government of Kherson, employing 475 hands and having a total production of 1,070,000 roubles; they are principally situated in the town of Odessa, the principal being Paraskev's, founded in 1858; it has 2 steam engines of 30 horse power, turns out 21,500 hides valued at 400,000 roubles and employs 117 men. Koadzaki's tannery has two steam engines and employs 38 men; the yearly production is 362,000 roubles or 36,200 hides. The Olviopolsk Tanning Co. in the district of Elizavetgrad was established in 1869; its production amounts to 180,000 roubles or 12,000 hides; it has one steam engine and employs 70 men. Most of the tanneries in the government of the western region are small excepting Malkiel's works in the Rejitsk district of the government of Vitebsk. This tannery was established in 1842; it has one 18 horse steam engine and 320 vats; its production amounts to 58,000 boot sole and half-tanned hides.

The governments of Poland occupy an important position in the leather trade and the principal Polish tanneries are by no means inferior to the best Russian works, both as regards the quantity and quality of their production. There are 210 tanneries in Poland and their total production amounts to 6,660,000 roubles, 58 of these with a total production of 5,554,000 roubles belonging to the government of Warsaw. Next comes the government of Radom with 25 tanneries and a production of 417,000 roubles. The principal Warsaw firms are: Temler, Schwede & Co., founded in 1819; these works have 2 steam engines of 60 horse power. Since 1881 this establishment has endowed a refuge for 190 children of both sexes. The yearly production is about 164,400 hides or 1,518,000 roubles; over 300 men are employed. The Shlenker Brothers tannery, founded in 1839, possesses two engines of 65 horse power. Here the workmen pay 2 per cent of their wages, and in case of illness receive half their pay and free medical treatment, the deficit of this, or about 2,000 roubles, being paid by the firm. The yearly production of this tannery is 820,000 roubles or 52,500 hides and 105 men are employed.

Pfeiffer's tannery, founded in 1854, has two steam engines giving 45 horse power. There is a school for workmen's children, a doctor, chemists shop and ambulance attached to the works. The yearly production amounts to 697,000 roubles or 139,400 hides, and 230 men are employed. Veigley's tannery, established in 1869, one 25 horse steam engine, comes next; at these works there is a fund to which the workmen subscribe for providing a doctor and giving assistance in cases of illness or death. The production amounts to 266,000 roubles or 28,000 hides; 120 men are employed.

There are two or three large tanneries in the government of Radom having a yearly production of over 100,000 roubles, and this sum is only exceeded by Karch's tannery in the town of Radom, the production of this firm being about 117,000 roubles or 17,000 hides; 60 hands are employed.

This brief survey of the state of the tanning and leather trade of Russia in Europe may be concluded with a few statistics relating to the industry in the Caucasus, Siberia and Turkestan, about 1890.

The Kouban district is the principal leather centre in the Caucasus, having 42 tanneries with a total production of 227,000 roubles. In the whole of the Caucasus there are 63, with a production amounting to 401,000 roubles. In Tiflis there is a large tannery, belonging to Adelkhan & Co., established in 1875; this firm was awarded the prize for boot sole and other kinds of hides at the Moscow Exhibition of 1882.

The leather trade of Siberia is principally centred in the governments of Tobolsk and Tomsk; in the former there are 90 tanneries with 727 hands, the yearly production amounting to 806,000 roubles, and in the latter there are 72, with 329 men and a yearly production of 349,000 roubles. The Kolmogorov works is one of the largest tanneries in the government of Tobolsk; it was founded over 100 years ago and has a production of 247,000 roubles or 35,912 hides.

In the Turkestan region there are 73 tanneries with 478 men and a production of 586,000 roubles; they are principally located as follows: Syr-Daria district, 13 tanneries, production 204,000 roubles; Semirechinsk district, 26 tanneries, production 127,000 roubles; and the Akmolinsk district, containing 14 with a production of 123,000 roubles. The majority of these tanneries are small and their production insignificant.



| FUR DRESSING AND SHEEPSKIN<br>TRADE.       | 1888.               |   |                     | 1889.               |   |                     |
|--|---------------------|---|---------------------|---------------------|---|---------------------|
|  | Number of<br>firms. | Production<br>in thousands<br>of roubles. | Number of<br>hands. | Number of<br>firms. | Production<br>in thousands<br>of roubles. | Number of<br>hands. |
| Russia in Europe without Finland . . . . . | 199                 | 1,505                                     | 2,264               | 186                 | 1,410                                     | 2,516               |
| The Caucasus . . . . .                     | 2                   | 6   | 8                   | 1                   | 2   | 2                   |
| Siberia and Turkestan . . . . .            | 40                  | 248                                       | 439                 | 35                  | 318                                       | 534                 |
| Total . . . . .                            | 241                 | 1,759                                     | 2,711               | 222                 | 1,730                                     | 3,052               |

In addition to this there are three sheepskin dressing firms in Finland having a total production of 16,000 roubles and employing 21 men.

The fur dressing and sheepskin trade is principally located in the eastern, northern and central governments of Russia in Europe and partly in Siberia. Besides being a manufacturing industry it also sometimes appears as a branch trade of the tallow and tanning works. Up to 1890 the total number of fur dressing and sheepskin firms was 222, their total production amounting to 1,642,000 roubles; besides this, 32 tallow works and tanneries dressed 103,000 roubles worth of sheepskins. Out of the 186 fur dressing and sheepskin works in Russia in Europe 38, with a total production of 210,000 roubles, belong to the government of Viatka. The eastern region comprises the following governments: Perm with 20 firms whose united production amounts to 139,000 roubles, Saratov with 24 firms and a production of 77,000 roubles, and Kazan with 3 firms and a production of 52,000 roubles.

The largest firms of the government are located in the town and district of Slobodsk, one of the principal in that town being Shelvakov's, which makes a speciality of sheepskins and sheepskin coats, their yearly production being about 25,000 of the former and 4,500 of the latter; they employ 40 men and do business to the amount of 30,000 roubles a year. Another large establishment belonging to Bospov dresses 300,000 squirrel skins per annum, costing 32,000 roubles and employing 12 men. Oglobin's factory in Slobodsk has a yearly production of 29,000 roubles and manufactures fur coats and jackets and sheepskin pelisses, employing 50 men. The centre of the fur dressing industry of the government of Perm is the town and district of Shadrinsk the principal firm being that of Botshagov, established in 1881, and having a production of 60,000 roubles a year. The chief fur dressing works in the government of Vladimir are that of Tourpanov, founded in 1882, the yearly production amounting to 60,000 roubles and consisting of 50,000 sheepskins and 4,000 fur coats employing 60 men; that of Tourlapov, founded in 1886, located in the town of Shoua, yearly production 70,000 roubles, consisting of 50,000 sheepskins, 60 men employed; that of Poukhov, established in 1850 in the same town, yearly production about 62,000 roubles, consisting of 40,000 sheepskins, 51 men employed; that of A. Tourlapov, founded in 1840 in the district of Shoua, yearly production 68,000 roubles, or 50,000 sheepskins,

120 men employed; and that of J. Tourlapov in the same district, established since 1882, yearly production 52,000 roubles, 30,000 sheepskins, 45 men employed.

| LEATHER GOODS TRADE.      | 1888.                |                                     |                  | 1889.                |                                     |                  |
|---------------------------|----------------------|-------------------------------------|------------------|----------------------|-------------------------------------|------------------|
|                           | Number of factories. | Production in thousands of roubles. | Number of hands. | Number of factories. | Production in thousands of roubles. | Number of hands. |
| European Russia . . . . . | 83                   | 2,172                               | 3,438            | 77                   | 2,199                               | 2,926            |
| Siberia . . . . .         | 4                    | 33                                  | 32               | 5                    | 25                                  | 34               |
|                           | 87                   | 2,210                               | 3,470            | 82                   | 2,224                               | 2,960            |

The present condition of the manufacturing leather goods trade, taken as an independent branch of the tanning industry, may be judged by the following statistics: the manufacture of boots and shoes, gloves, gauntlets, harness, trunks and small articles, such as purses, is carried on in 82 factories, employing 2,960 hands; 75 of these factories, whose united production amounts to 2,186,000 roubles per annum and having a total of 2,892 hands, are situated in Russia in Europe. There are also 2 factories employing 34 men and having a production of 13,000 roubles in Poland, and in Siberia there are 5, employing 34 men and having a production of 25,000 roubles. The most important factories are located in the government of Moscow where there are 20 with a united production of 707,000 roubles. The principal firms manufacturing boots, shoes and harness in the town and district of Moscow are: 1. Malkiel's factory established in 1879; it has 3 steam engines with a total of 47 horse power, the yearly production amounting to 200,000 roubles, and 120 men are employed. 2. Barykhanov's factory, founded in 1839, engaged in the manufacture of artillery harness, yearly production 185,000 roubles, 80 men employed.

The glove factories are very numerous and vary greatly in size, from the smallest which turn out less than 1,000 dozen per annum, to the largest, like Timister's factory, which turns out 10,000 dozen, worth 150,000 roubles; this firm employs 120 men and has one 8 horse power steam engine. Sorokin's factory turns out 5,000 dozen per annum; it was founded in 1871; Doubensky's factory has about the same production.

The St-Petersburg factories are in point of production by no means inferior to those of Moscow. The St-Petersburg manufactory for machine-made boots and shoes, established in 1877, has a yearly production of 600,000 roubles and turns out over 200,000 pairs of men and women boots and shoes; the machinery is driven by one 25 horse power steam engine; 508 men are employed. There is a chemist's shop and a doctor's office on the premises. The firm subscribes to the Narva school for working men's children. Another large factory, belonging to Southam, manufactures

leather belting and hose pipe; it was founded in 1882, has one 8 horse power steam engine, and an annual production of 140,000 roubles. There is also a special purse manufactory belonging to Gustman, founded in 1883.

The government of Perm ranks third in importance in this branch of industry; it has 23 factories with a total production of 311,000 roubles; next comes the government of Livonia with 2 leather goods factories with a total production of 210,000 roubles, and the government of Tula comes last with two factories having a total production of 165,000 roubles. The principal factory in the government of Livonia is Shleiher's Glove Manufactory in Riga, founded in 1870; its production amounts to 200,000 roubles per annum; 250 men are employed in it.

#### IMPORT OF LEATHER GOODS.

These may be divided into 4 classes: *a.* raw hides, pelts; *b.* tanned and dressed hides, straps, belting, varnished leather; *c.* furs; *d.* leather goods, such as boots, shoes and harness.

|                   | 1884.      | 1885.      | 1886.      | 1887.      | 1888.      | 1889.      | 1890.      |
|-------------------|------------|------------|------------|------------|------------|------------|------------|
| R O U B L E S.    |            |            |            |            |            |            |            |
| a. Raw hides. .   | 2,484,003  | 2,419,785  | 1,308,767  | 1,233,478  | 3,611,895  | 4,339,336  | 3,642,157  |
| b. Tanned hides.  | 4,635,544  | 5,647,999  | 4,711,685  | 4,456,449  | 3,601,106  | 4,267,291  | 4,412,518  |
| c. Furs . . . .   | 8,237,279  | 8,640,855  | 8,598,046  | 4,265,106  | 6,981,266  | 7,534,773  | 5,489,668  |
| d. Leather goods. | 1,133,394  | 969,905    | 885,873    | 792,587    | 564,128    | 833,799    | 670,422    |
| Total . .         | 16,490,220 | 17,678,544 | 15,504,371 | 10,747,620 | 14,758,395 | 16,975,199 | 14,214,765 |

The import of leather and leathern goods in 1884 amounted to 16,500,000 roubles; in 1885 it showed a considerable increase but afterwards began to decline, and in 1887 fell to the minimum of 10,750,000 roubles; after that it again rose and in 1889 reached 17 million roubles. These fluctuations are in strict accordance with those of the native industry and clearly show the indirect proportion between the import and the progress of the internal trade. In 1885 the home production amounted to 40,300,000 roubles and the import to 17,700,000. In 1886 the production showed an increase of about 2 millions and the import decreased by almost the same sum. In 1887 the production attained the maximum of 44,800,000, roubles and the import fell to its lowest point of 10,700,000, after which the production began to fall off and the import accordingly rose. Upon examining the various items of the import it will be found that the furs are the most important, as they average about 46.75 per cent of the total, excepting in 1887. The next important article is tanned and dressed hides, which are fairly constant at about 30 per cent of the total import next come the raw hides averaging about 17.25 per cent, and lastly the leather manufactured goods averaging about 5 per cent of the total import.

The import of raw hides amounted to 163,222 pouds in 1869, and with some slight fluctuations continually increased. From 1869 to 1872 it reached the yearly average of 308,638 pouds and during the next period of four years, from 1872 to 1876, the mean yearly import rose to 320,460 pouds. In 1877 this import decreased to almost one-half, or 185,726 pouds. During the next period of four years, from 1878 to 1881, the import of raw hides showed great variations, but attained the very high average of 507,168 pouds, that of 1879 being the highest, namely 745,677 pouds. After the introduction of the customhouse duty in 1882 the import of raw hides through the European frontier showed a constant decrease, the average for 1882 and 1883 being 321,473 pouds, and the mean yearly import during the three years period from 1884 to 1886 fell to 243,815 pouds or 2,033,988 roubles. The total import through the European, Finnish and Asiatic frontiers was as follows, exhibiting a marked decrease every year:

|              |                   |
|--------------|-------------------|
| 1884 . . . . | 2,484,003 roubles |
| 1885 . . . . | 2,419,785    >    |
| 1886 . . . . | 1,644,184    >    |

During the next five years the import fluctuated considerably but showed a great tendency to rise, as seen by the item a. in the table of the leather goods import, increasing suddenly in 1889 to the sum of 2,484,003 roubles, or 60 per cent higher than in the preceding year; the import rapidly decreased and in 1887 it fell to 1,233,478 roubles, in 1888 however it again rose to 3,611,895 roubles; in the following year of 1889 it increased to 4,339,336 roubles and in 1890 it again decreased to 3,642,157 roubles. The import of salted hides showed the greatest fluctuations; in 1887 it amounted to 406,350 roubles and in the following year it increased to 2,066,944 roubles or five times.

Of late years the import has chiefly consisted of American bull hides, as there are not many large bulls in Russia. The hides of the Russian cattle have a tendency to become thinner, and yet they are becoming more expensive. In St. Petersburg fresh raw hides of Circassian cattle, weighing from 60 to 70 pounds per hide, cost from 3.60 to 4.20 roubles per pound, and American salted hides from Rio Grande, Buenos Ayres and Rio Janeiro, weighing from 70 to 80 pounds per hide cost 6.50 to 7.50 roubles. The import of foreign thick hides does not only arise from the insufficient quantity of Circassian hides, but also from the fact that American thick hides are in many cases indispensable for manufacturing the heavier kinds of sole leather and belting. The American hides are principally imported in the salted state.

From 1869 to 1884 inclusive, the import of dressed hides constantly increased. This increase was uninterrupted from 1869 to 1876 but in the latter year, just before the duty was considerably raised in consequence of its being charged in gold, the import suddenly showed a considerable increase, and then in 1877 it greatly diminished; in 1878 it again rose and exceeded the amount of all the preceding years, and kept on increasing until 1884. From this date the import of dressed hides has remained pretty constant, excepting a slight rise in 1885 and a fall in 1888, and keeps very near the average of 4,500,000 roubles, or 30 per cent of the total

import, or 10 per cent of the home production. The greater part of the dressed hides are supplied by Germany, about 60 per cent, and Great Britain, about 30 per cent, whilst Austro-Hungary and France send small quantities. The chief items of this import are small and large hides, varnished leather and belting.

The import of varnished leather from 1887 to 1890 only experienced very slight fluctuations and kept very near the average of 2,192,000 roubles. The import of belting during the same period averaged about 980,000 roubles; it fell to its lowest point of 895,586 roubles in 1888, and reached the maximum figure of 1,145,985 roubles in 1884, and in 1885 fell to 927,019 roubles. The import of furs varied on the average between 4,250,000 to 8,500,000 roubles, the principal kinds being sable, black fox and muskrat, other kinds being but very little imported. The import of wrought leather is small and consists of boots and shoes, gloves, saddlery and harness.

### LEATHER EXPORT TRADE.

The export of leathern goods may be classed under the same four heads: a. raw hides, b. dressed hides, c. furs, d. wrought leather goods. The amounts during the period from 1884 to 1890 are given in the following table.

|                   | 1884.     | 1885.     | 1886.      | 1887.      | 1888.      | 1889.      | 1890.      |
|-------------------|-----------|-----------|------------|------------|------------|------------|------------|
| R O U B L E S.    |           |           |            |            |            |            |            |
| a. Raw hides. .   | 4,521,021 | 4,067,842 | 5,076,510  | 5,729,156  | 5,312,967  | 4,257,998  | 5,530,542  |
| b. Dressed hides. | 675,472   | 984,255   | 1,698,793  | 2,071,775  | 1,384,967  | 1,636,964  | 956,946    |
| c. Furs . . . .   | 4,020,083 | 3,385,298 | 5,446,372  | 3,938,757  | 4,242,843  | 6,238,845  | 5,163,737  |
| d. Leather goods  | 718,668   | 160,000   | 389,208    | 1,100,408  | 971,980    | 780,779    | 894,294    |
| Total . .         | 9,935,244 | 8,597,395 | 12,610,883 | 12,840,096 | 11,912,757 | 12,914,586 | 12,545,519 |

Generally speaking the import exceeds the export. In 1884 the export amounted almost to 10,000,000 roubles; in the following year it decreased, and in 1886 rose to 12,500,000, and finally, excepting some slight fluctuations, kept fairly steady at the average of 12,500,000 roubles up to 1890.

The principal item of export was raw hides which, in 1884 and 1885, amounted to about 4 million roubles and from 1886 to 1890 averaged 5 millions. The next important item is furs, the mean export of which was 4,500,000 roubles, but varying greatly each year. The next two items averaged 1,300,000 roubles and 700,000 roubles respectively.

The export of raw hides through the European frontier during the decade ending 1879 averaged 234,553 pounds per annum, from 1880 to 1883 it rose to 388,421 pounds, then fluctuated considerably from 1883 to 1886, the mean yearly

export for the three years being 341,575 pounds or 4,225,901 roubles; during the next half-decade it rose nearly 1,300,000 roubles above that of the previous five years, and averaged 5,500,000 roubles and remained fairly constant during 1887, 1888 and 1890, only falling in 1889 to 4,250,000 roubles. This export may be divided into small and large hides. The export of large hides varies greatly from year to year; in 1887 it reached the lowest point of 706,203 roubles, but then rose to 1,580,535 roubles in 1890, the mean export from 1887 to 1890 being 1,427,000 roubles. The export of the small hides was a less important item, the yearly average for the same period of 1887 to 1890 inclusive being 3,623,000 roubles, with very slight yearly fluctuations.

The increase or decrease of the export of raw hides does not seem to be the result of a greater or less demand, but rather a matter of chance and principally depends upon the price of fodder. When fodder is scarce the export of raw hides is very large, and the years 1869 and 1870 may be taken as an example to show how greatly this export varies; in 1867 it amounted to 376,382 pounds, and in 1870 it fell to 163,026 pounds; in 1870 it further fell to 143,026 pounds, or only 38 per cent of the preceding year. The greatest demand for the Russian leather exports is in Germany whilst Great Britain and Austro-Hungary import the same articles but only to the amount of 25 per cent of what Germany consumes.

Small, dry hides, principally calfskins, are sent abroad from the governments in the interior, the Baltic region and the south of Russia, through St-Petersburg, Riga and Odessa. Goatskins are exported from the government of Kazan and other eastern governments; horse hides, from the governments along the Volga; and light cow hides from the Nizhni-Novgorod fair. The hides are only sold by weight in St-Petersburg and partly in other parts, in all other places they are sold by the piece. At the Nizhni-Novgorod, Kretshensk, Troitsk and Menzelinsk fairs almost all the goods are also sold by the piece. The export of dressed hides and wrought leather is so small that it may be passed over entirely.

The export of furs from 1880 to 1890 was subject to great fluctuations, but is in general increasing, although not progressively. The average export during the last four years amounted to 4,896,000 roubles, or 31 per cent of the mean total leather export, and 90 per cent of this quantity, or 4,417,989 roubles, passed through the European frontier, while 1 per cent, or 56,786 roubles, was exported through the Finnish frontier, and 8 per cent or 421,271 roubles, through the Asiatic frontier. The chief consumers were Germany, France and Great Britain, and small quantities were exported to Austro-Hungary, Holland, Belgium, Italy and Roumania.

#### VARIETIES OF LEATHER DRESSED IN RUSSIA.

All well known processes are used in the Russian leather dressing trade, tanning, tawing, stuffing, and consequently there is a great variety of different kinds of leather produced, the following being the most important: I. Tanned leather; II. Tawed leather; III. Shamois leather.

## I. Tanned leather.

### HEAVY SOLE LEATHER MANUFACTURED FROM AMERICAN. CIRCASSIAN BULL AND BUFFALO HIDES.

The former are principally imported in the salted condition and the latter raw, straight from the slaughter houses. Raw hides are also used for manufacturing heavy driving belts. The peculiarity of sole leather manufacture is that it is not subjected to the action of lye, lime or potash but is treated with old tan liquor mixed with rye flour, and undergoes cold fomentation and sweating. Sole leather is divided into two kinds, one being prepared by the flour process and the other with the tan liquor. The former variety is an old and popular article; the process consists in first washing the hide, then bucking in flour and tanning by sprinkling with oak bark four or five times. The drying is carried on in summer or winter, the latter season imparting a deeper reddish brown tint to the leather. The hides are not subjected to any finishing process and their appearance is not pleasing but they are prized by the lower classes. Liquor-tanned sole leather is a much better known article: the process consists in first washing and scraping the hides, then sprinkling them with salt upon the flesh side, folding them down the middle and laying them in packs. This operation replaces the lye treatment; then follows the depilating process, liquor treatment and tanning, which is repeated four times. In former times sulphuric acid was sometimes added to the liquor to hurry the process, but this proved injurious and was later on abandoned. The tanning of liquor-treated sole leather is generally effected with willow, or oak bark, and sometimes certain concentrated extracts such as wattle, hemlock and sumach are used. The sole leather hides are not subjected to any finishing processes but are only rolled or hammered.

### HALF-TANNED SOLE LEATHER.

This leather is manufactured from the lighter bull and cow hides, as it is principally used for making ladies boots. It is also used for making small articles such as cartridge pouches, and inner soles, in which cases the smallest hides are used. The essential difference in the preparation of this variety of leather is that the raw hides, after having been washed and scraped, are treated with a mixture of lime and ashes or potash, according to the method practised in the east of Russia, or only with lime as in the north-west and south; the steeping and tanning then follow, the latter operation being repeated three times. Driving belts are prepared in this manner, but the largest belts are made of large American and Circassian hides, weighing 60 to 80 pounds each. This leather is tanned three times and then passed through rolls or hammered, greased with tallow, cut into strips which are sewn together with thongs, or else fastened with copper rivets.

### SOFT LEATHER.

This leather must be flexible and comparatively light, and is therefore generally manufactured from the hides of calves, young cows, barren cows and heifers.

### 1. *Russia leather.*

This article is prepared from all the above mentioned raw materials except calfskins. After washing and scraping, the hides are treated with ash, then washed, passed through the stamping mill, pared, pressed, tanned in weak liquor and then in ooze, and by sprinkling; it is either white, red or black. The best hides are used for the white leather which, when tanned, is smeared on the flesh side with a mixture of birch tar and seal grease.

The red Russia leather is prepared in the same way, but when dried is coated with a solution of alum and dyed with red sandalwood. The black leather is dyed after tanning with some salts of iron and then smeared on the flesh side with a mixture of birch tar and calf grease. This smearing is repeated, if the so-called tarred Russia leather is required. All this class of goods undergoes various finishing processes to give the requisite appearance. These finishing operations are frequently repeated several times; the dried hides are softened, kneaded, pared with a paring knife, stuffed and rolled upon grained boards to impart a given design to their surface, either fine or coarse shagreen, striped or fancy patterns; if however a smooth or polished surface is required the face is rubbed with glass or stone. When finished the hide is slightly greased with seal grease or tallow. Black tarred goods are smeared with a mixture of tar and grease. Smooth or small grained white Russia leather is principally used for soldiers boots and cartridge pouches, trunks and bags. Red grained Russia leather is sold in Asia and also exported in considerable quantities to western Europe, where it is much prized by foreigners who call it Russia leather and use it for making a variety of small articles, such as purses and cigar cases, for which Vienna is particularly famed. Black Russia leather is dressed smooth or grained and is used by harness makers, trunk makers, coach builders, and also for making ordinary boots and shoes.

### 2. *Dressed calf leather and calfskins.*

Both these varieties are used for making light boots and shoes and numerous other articles. The raw material in both cases is the hide of young calves, and the processes of manufacture are the same as those of Russia leather, the only changes being those necessitated by the smaller size of the hides. Calfskin is made from the hide of milk calves and is easily recognized by the colour of the flesh side; it is tender, soft, flexible and strong, and is therefore more valued than ordinary calf leather; much of it is sent abroad.

### 3. *Horse hides.*

The rump part of large horse hides is close and hard and is used for sole leather. The smaller hides are used for making white and black Russia leather, known as Hamburg leather. The hides of milk stallions are used instead of calfskins. The manufacturing processes are the same as those of Russia leather and calfskin. Horse hides are not so highly prized as those of horned cattle. Different kinds of leather are also made from goatskins, sheepskins and lambskins, the following being the principal varieties.



#### 4. *Morocco.*

This may be leather made of goatskin or sheepskin. Goatskin morocco was formerly exported in large quantities to China, but the demand for it there has now greatly decreased, and it is principally used for shoemaking in the interior of Russia. Goatskins are so strong and hard that a strong potash treatment is required to get rid of the hair; they are worked up with dog dung in a rotating cylinder, and in tanned liquor. For tanning, the skins are sewn face outwards into bags, into which the tanning liquor is poured and then covered with fine willow bark, arbuté or sumach. When tanned the skins are dyed, dried, pressed and rolled on grained boards or else smoothed with stones, the grained quality being that used in China whilst the smooth skins are used in Russia.

#### 5. *Ordinary morocco.*

This leather is usually made of sheepskins and lambskins, especially merino sheepskins. In order to avoid damaging the hair whilst removing it, lye sweating chambers and jellies are used, and the morocco is tanned the same as soft leather and then dyed and dressed. Sheepskin morocco is less durable than goatskin morocco and is not suitable for shoemaking.

#### 6. *Lambskins, common or merino.*

This quality is prepared in the same way as small, barren cow hides, and is used for making gauntlets, women cheap shoes, and underwear.

#### 7. *Sheepskins dressed in the wool.*

This leather is used for coats, jackets, collars and the like; it differs in the age and breed of the animal and in the way of dressing. The tanned skins are the most highly prized and the best are from the morlings and Romanov sheep.

## II. **Tawed leather.**

There are three varieties of tawed leather, the difference being in the processes used in their manufacture; namely, that treated with flour is called German curried or Hungarian and Kalmuck tawed leather. This article may be manufactured from sheepskins, lambskins, goatskins and calfskins; it has a certain advantage over tanned leather in supporting a greater breaking strain and can therefore be used for belting and harness, but as it is not waterproof it requires to be well greased.

#### 1. *Flour treated tawed leather.*

This variety is a very popular article; it is made by agitating the raw hide in a warm mixture of rye flour and salt; the hair is then removed and the hide treated with flour and alum, after which it is repeatedly washed, dried and greased with an unguent of seal fat, tar and tallow, and finally pressed and dried.

### 2. *German tawed leather.*

This leather differs from the previous kind in being treated with ash; it has a better appearance but is less durable.

### 3. *Hungarian tawed leather.*

This quality is stronger than the two above mentioned varieties, as the hair is not removed by the action of chemical reagents, but by scraping with a special kind of knife.

### 4. *Kalmuck tawed leather.*

Out of this leather remarkably strong straps are made; it is prepared in the following way: the raw hide, without undergoing any preliminary treatment, is cut into strips suitable for straps, scraped on both sides with a sharp knife and liberally greased with tallow and train oil; several strips are then twisted together, hung on a hook and stretched by suspending a weight to the lower extremity, the weight is allowed to turn, first in one direction and then in the other, so as to stretch and twist the leather, and finally the greasing is repeated. The thinnest straps made in this way are remarkable for their great strength.

### 5. *Kid.*

This quality is made of lambskin, skeepskin, sometimes rabbitskin, but the finest quality is made of the skin of milk goats. It is prepared in the same way as tawed leather. The raw or steeped skin is treated with lime, depilated, then treated with a bran and alum mixture, which is different from that usually employed as it contains salt, alum, rye flour and yolks of eggs, one yolk for each skin. Then follow several processes such as washing, kneading, paring, and pressing. If the kid has to be dyed it is pared on a marble slab.

## III. *Shamois leather.*

This variety is made of the skin of deer, elk, buck, camel, goat, sheep and calf, the first three being the best. After the usual processes of steeping and depilating the skins are saturated with oil, then rolled repeatedly and exposed to the air to oxidize the oil and remove the excess, then finally dried and stretched.

The following statistics may be recapitulated as showing the condition of the Russian leather trade at the beginning of 1890.

|  |             |
|--|-------------|
| Tanneries and leather works in 1889, in Russia . . . | 2,604.      |
| Men employed . . . . .                               | 27,523.     |
| Production in roubles . . . . .                      | 42,000,000. |
| Average production per tannery . . . . .             | 16,129.     |
| Production per capita . . . . .                      | 1,530.      |
| Leather import in roubles . . . . .                  | 17,000,000. |
| Leather export in roubles . . . . .                  | 13,000,000. |
| Consumption in Russia in roubles . . . . .           | 46,000,000. |
| Consumption in Russia per capita in kopecks . . . .  | 38.         |

If the village leather industry be also taken into account, the total consumption would be as follows:

|   |                       |
|---|-----------------------|
| Yearly consumption of manufactured goods . . .  | 46,000,000 roubles    |
| Yearly consumption of the village product . . . | 58,000,000 >          |
|   | Total . 104,000,000 > |
| Consumption per capita . . . . .                | 0.87                  |

The following figures represent the present condition of the village leather industry.

|                                 | Number of undertakings. | Number of men employed | Production in roubles. |
|---------------------------------|-------------------------|------------------------|------------------------|
| Unwrought leather. . . . .      | 9,500                   | 21,000                 | 12,000,000             |
| Wrought leather. . . . .        | 29,000                  | 85,000                 | 26,000,000             |
| Furriery and sheepskin. . . . . | —                       | 40,000                 | 20,000,000             |
| Total . . . . .                 | —                       | 146,000                | 58,000,000             |

The production of each workman amounts to nearly 400 roubles. The total yearly output of the whole leather trade, therefore, amounts to 104 million roubles, and the total number of men employed in it is about 173,523.

These figures prove that this trade is one of the most important in Russia and that the village production exceeds that of the factories by 38 per cent, and is therefore of such importance that it requires to be dealt with separately.

#### THE VILLAGE LEATHER INDUSTRY.

This occupation is one of the most important in Russia, as its production is very large, and the trade widely spread among the inhabitants. Statistics show that tanning is practiced as a village industry in 44 governments, or 160 districts, occupying about 9,500 households or about 21,000 men, and that the annual production amounts to 12,000,000 roubles or about 28 per cent of that of the factories. The production of wrought leather is spread over 40 governments, or 150 districts, and occupies 85,000 men, the annual production being about 26,000,000 roubles. The large manufactories do not compete to any great extent in this branch of trade, consisting principally of boots and shoes, shamois goods, harness and other kinds of wrought leather. A large number of men are also employed in tanning sheepskins used for clothing in the villages; this business is carried on in 33 governments, and 137 districts, the number of men engaged in it being about 40,000; the value of the yearly production is estimated at 20,000,000 roubles, or about 10 times that of the manufactories. These last figures are probably too small as the number of village furriers most likely would be larger, as many are not registered in the hope of evading the tax levied upon them. It cannot be stated at what precise date the village tanning business originated, but there is no doubt that it existed in this form long before

it became a regular manufacturing enterprise. The landowners rendered some assistance towards developing the industry, as it was their custom to apprentice some of their peasants to some form of trade, these young men, on their return home, practicing their trade on their master's estate. In this way the village handicrafts greatly improved and spread among the peasants.

The village industry, like all others, depends completely upon the economical conditions of life and property of the inhabitants. In those governments where agriculture cannot be carried on to any great extent the village trades are more important and in the agricultural districts they rarely exist except when the peasants are short of land. The village leather industry is under those same conditions which separate every village trade from the manufacturing industries, and is characterized by the small production of each individual producer, the primitive processes still in use and the old fashioned style of wrought leather. These drawbacks are due to the unfavourable circumstances in which the cottagers pursuing this calling are situated, namely, want of capital, insufficient knowledge, and difficulties in procuring raw material and in disposing of their goods. They purchase their raw material in the villages and bazars or from special middlemen. It is also a matter of difficulty for them to acquire the necessary materials for dressing the hides as they are generally unable to procure bark directly from those who collect it and are obliged to buy it from the middlemen, who sell powdered oak and willow bark at 55 to 70 kopecks per poud.

The methods practiced by the cottagers are very simple even crude and primitive. They have rarely a workshop but content themselves with the cottage which they dwell in with their families; the vat used for steeping and tanning the hides is placed in the street and the hides are kneaded and greased at home. Their instruments are likewise very imperfect. The work is generally carried on by the members of the family, and only the more well to do peasants hire workmen, and these generally live with the family, receiving wages which vary greatly according to the locality, 15 to 25 kopecks in the Viatka district, and as much as 55 to 60 kopecks per day in the Vasilsk district of the government of Nizhni-Novgorod, their food being provided. In some places, as for instance in the Chernigov district, the peasants club together to buy materials, and work in common.

The absence of capital and the practice of obtaining raw material on credit has an evil influence upon the quality of the goods, as some of the processes of manufacture are omitted altogether, whilst others are shortened to such an extent as to spoil the quality of the leather; for instance, the tanning process, without taking any special measures to hurry the operation, is not prolonged sufficiently to tan the hides thoroughly, and lasts but three months in the government of Tver, and two or even one and a half months, in the district of Chernigov. The principal consumers are the peasants themselves who are not particularly exacting in their choice. The profits accruing from this trade cannot be regarded as being very large; in the Viatka district they amount to about 5.5 to 6.5 per cent clear profit of their gross receipts. The highest profits are realized by those who do piece work for the large manufactories, hides and materials all being found. In the government of Moscow a cottager assisted by a family of three persons will dress hides to the value of 1,800 roubles a year, and make 13 per cent clear profit.

The latest statistics from private sources tend to show that in some parts of Russia the village leather trade is being absorbed gradually by the manufacturing industry, for instance, in the governments of Tver and Moscow such has been the tendency during the last 30 or 40 years, as that far back the production of the village trade greatly exceeded that of the manufactories, whilst at present it is just the reverse. Recognizing the importance of developing, improving and strengthening the village industries of Russia, the Government and private institutions have continually studied the question and have instituted measures to raise and foster the village handicrafts. As an example of efforts taken in this direction may be cited the museum of village trades work, organized some years ago by the country states in Moscow in connection with which there are also ambulating workshops for instructing adult village craftsmen; as additional evidence to the same end, may be cited artisan classes attached to the rural schools, kept up at the expense of the Ministry of Public Instruction for propagating mechanical knowledge among the rural population.

Tanning is carried on as a village industry in the governments of Saratov, Perm, Kazan, Penza, Tver, Poltava, Chernigov, Viatka, and in the Terskoi and Kuban districts of the Caucasus. The extent of the trade varies greatly in the above mentioned localities; thus for instance, in the government of Saratov there are 240 tanners, in the colonies of the Kamyshinsk district there are 165, whilst in the government of Perm there are 500 village tanners, with a yearly production amounting to 200,000 roubles; and in the government of Viatka, although the trade has been of late years developing into a manufacturing industry, the village tanners produce leather goods to the value of 4,000,000 roubles a year.

In the government of Tver there are 166 village tanyards with 350 workmen. By comparing the number of village tanyards with that of the large tanneries together with their respective productions at the present time and 30 years ago, it may be at once seen that the village industry is merging into the manufacturing trade, especially in the governments of Tver and Moscow. The village of Kimry in the Korchevsk district, is a great shoemaking centre, and uses the hides tanned in the surrounding districts. In the village itself and in its immediate neighbourhood the trade has however passed from the village industry to the manufacturing stage. Within the precincts of the village there is a small manufactory belonging to Rybkin and lately in the neighbourhood a large manufactory has been built by Potapenko who makes, in addition to other kinds of leather, horse leather by a special Hamburg process hitherto only employed in Poland.

In the governments of Poltava and Chernigov the village leather trade has not developed much in quantity, nevertheless the absence of leather manufacturing in the former and in the southern portion of the latter, combined with the scarcity of land and dense population have given rise to the establishment of a village tanning trade, the raw material consisting of the skins of domestic animals. The principal centres of the trade are Olishevka, Novysenzhary and Sidnev. At Olishevka the tanning business is carried on in 200 households, and in the other two places, in about 50 or 60 families each. The sale of the hides is somewhat hampered by their inferior quality and they are only suitable for local consumption. The village craftsmen of Sidnev supply the shoemakers in the town of Berezna in the Chernigov district with hides.



The shoemaking and wrought leather trades, harness making, trunk making et cetera, are generally closely connected with the tanning industry. The chief shoemaking centre is the south-eastern part of the government of Tver, especially the districts of Kashin, Kalazin and Korcheva. The village of Kimry is, as has already been stated, celebrated for its boots; it is also the market for the sale of goods from the extensive region where all kinds of boots and shoes are made. The best ladies and side-spring boots at the Moscow Exhibition of 1882 were exhibited by the village shoemaker Stoliarov, who was also awarded a medal at the Exposition of Amsterdam. Ladies boots cost from 2.20 to 4 roubles per pair, men's boots of various kinds, such as high boots, hunting boots, varnished boots, blacked boots and children's boots of good shape and quality are sold by the village shoemakers at the following wholesale prices:

|                                   |                |
|-----------------------------------|----------------|
| High boots . . . . .              | 8.00 roubles.  |
| Hunting boots. . . . .            | 9.00 >         |
| Varnished boots . . , . . . .     | 13.00 >        |
| High calfskin boots . . . . .     | 7.00 >         |
| Ordinary calfskin boots . . . . . | 3.65 to 4.00 > |
| Hamburg boots . . . . .           | 4.40 to 4.80 > |
| Kid side-spring . . . . . , . .   | 3.60 to 3.90 > |
| Same with galoches . . . . .      | 7.00 >         |

The following table gives a detailed price list of goods from the Kimry and Taldomsk districts.

|   | R O U B L E S. |      |
|---|----------------|------|
|   | FROM.          | TO.  |
| KIMRY DISTRICT:   |                |      |
| Cow hide high boots. . . . .                              | 3.50           | 5.   |
| Horse hide ditto . . . . .                                | 2.25           | 4.   |
| Medium sized boots . . . . .                              | 0.90           | 2.50 |
| Children's ditto . . . . .                                | 0.60           | 1.30 |
| White or blacked calfskin boots . . . . .                 | 1.60           | 2.50 |
| Women's half-boots, calfskin . . . . .                    | 2.             | 2.75 |
| Ditto horse hide shagreen . . . . .                       | 1.             | 1.60 |
| Women's half-boots, medium size . . . . .                 | 0.80           | 1.70 |
| Ditto children's size . . . . .                           | —              | 1.17 |
| TALDOMSK DISTRICT.  |                |      |
| Leather gaiters. . . . .                                  | 2.             | 2.50 |
| Prunella shoes . . . . .                                  | 0.80           | 1.70 |
| Men's shagreen slippers, trimmed patent leathers. . . . . | 0.90           | 1.10 |
| Ditto plain . . . . .                                     | 0.40           | 0.45 |
| Children's shoes . . . . .                                | 0.10           | 0.40 |

The Kimry boots and shoes are sold in Moscow, Nizhni-Novgorod, at the Little Russia fairs, in Rostov-on-Don, the Caucasus and Siberia. The shoemaking trade is also carried on in the Vesegonsk district of the government of Tver, especially in the town of Krasnyi-Holm and the adjacent villages; this region makes a speciality of heavy work boots which are quite water proof; they cost from 2 to 3 roubles a pair according to the quality and time of year. The white boots made at Ostashkov in the government of Tver are well known, the large turned over boots cost from 2.50 to 3.20 roubles, nailed boots from 4.20 to 5.20 roubles; women's and children's sizes are also made. These boots are principally used by the fishermen in St. Petersburg, Pskov, Yuriev (Dorpat), Reval and Riga. The village shoemakers of the government of Kursk, who are fairly numerous, particularly in the village of Veliko-Michailovka in the district of Novo-Oskolsk, where they number 1,600 men, practice a peculiar division of labour: one man cuts out the boots and is known as a cutter, another sews the uppers together whilst a third sews on the sole, makes the heels, fits the boots on the trees, and finishes them off. In winter the prices are uniform, rising a little in spring, and in autumn they are considerably firmer; this is due to the varying demand.

The shoemaking trade also pervades some of those places which have been cited as centres of the leather making industry, such as the Alexeyevsk group of villages in the government of Saratov and its district, where about one-third of the male population are engaged in the village shoemaking trade; the government of Poltava, the southern part of that of Chernigov, in the Oposhninsk volost of the Zenkovsk district; in the government of Poltava there are as many as 500 shoemakers, whilst in the town of Berezna in the government of Chernigov and its district there are over a thousand. In the government of Perm the shoemaking trade is carried on at the Nevyansk and Berezovsk works of the Ekaterinburg district, where there are 228 shoemaking establishments, with 1,075 workmen and a yearly production of 500,000 roubles. The shoemakers of the Irghinsk works in the Krasnooufmsk district, numbering 500 families, have a like production. There are many such groups of village shoemakers in the government of Perm; their total production amounts to over 2,000,000 roubles and their goods are partly sold for local consumption or, for the greater part, sent to Siberia.

The various kinds of leather goods made by the village artisans of the government of Viatka have been already mentioned, and judging from the samples of boots, trunks, knapsacks, purses et cetera, exhibited at the Kazan Industrial Exposition of 1890, they seem to be of excellent quality. Saddlery and harness making are mostly connected with shoemaking in the government of Perm, but also exist independently in the Ekaterinburg and Koungoursk district; they are carried on also in the government of Penza and are in a fairly developed condition in the Caucasus, especially in the Terskoi and Kuban districts.

The chief centres of the fur dressing trade, and particularly of the manufacture of sheepskin coats, are the governments of Viatka, Perm, Chernigov, Poltava and Kiev. The districts of Slobodsk and Viatka are the headquarters of the village furriers of the government of Viatka, their yearly production amounting to 850,000 roubles; and their fur jackets are deservedly popular. The village fur trade of the government of Perm is only capable of supplying the local demand.

In the Romensk and Pereyaslavsk districts of the government of Poltava the village furriers carry on a great trade in sheepskin dressing and the manufacture of sheepskin coats and jackets, which they cut and trim to suit the taste of their customers and the demands of the market. The trimming consists of braid, embroidery, common sorts of Astrakhan or other cheap fur. The price of these fur coats and jackets ranges from 9 to 12 roubles, according to their quality, and sometimes reaches 27 roubles. Quantities of these goods are sent from Berezna to Dobrianka in the Gorodniansk district and to Homel in the government of Moghilev. Besides this the village sheepskin dressing trade is carried on in a small way in Beshetilovka in the government of Poltava and in Koropa in the Krolevetsk district.

The sheepskin coat trade has existed for a very long time in the Kanevsk district of the government of Kiev, the village of Bogoslav having almost the monopoly and containing 180 household furriers. They obtain their raw material from the Little Russia fairs and dispose of their goods, valued at about 60,000 roubles a year, at the local markets. The fur-dressing trade is carried on in some districts of the government of Penza, in those places where leather dressing exists as a village industry. The village Ramzay in the district of Penza is among other places, noted for its sheepskin and fur-dressing trade.





## CHAPTER VII.

## India rubber trade.

CAOUTCHOUC made its first appearance in Europe towards the end of the last century, whilst gutta-percha was not known until the middle of the present. The manufacture of caoutchouc was however only started at the commencement of this century, the first patent being granted to Mackintosh in 1828 for his process of dissolving caoutchouc in naphtha oil and applying the solution to clothes. An invention for making thread out of caoutchouc was brought out about the same time. This trade was, however, most materially developed by the discovery of vulcanizing caoutchouc by treating it with sulphur, made by Mr. Ludersdorf in 1882. The vulcanizing processes discovered by Goodyear in America in 1839 and by Hancock in England in 1843, have placed the india rubber trade on a level with the other manufacturing industries.

This trade sprang up in Russia soon after 1830. The first factory was opened in St. Petersburg by Henry Kirstein. In 1844 there were already two manufactories, their united production in 1845 amounting to 90,080 roubles and rising to 132,072 roubles in 1849. In 1852 there were four manufactories, but in the following year three of them closed, that of Kirstein alone remaining. This decline of the india rubber trade may be attributed to its comparatively early stage of existence; the choice of goods manufactured was not made with sufficient judgment and the prices were high.

The Government saw the necessity of this trade, which had only begun to develop, and in 1857 raised the import duty on foreign india rubber and gutta-percha goods. This circumstance placed the trade under particularly favourable conditions and it rapidly developed. In 1860 there were five mills employing 298 hands and having a production of 412,160 roubles. In the same year the Russian-American India Rubber Manufacturing Company was established in St. Petersburg. This establishment began to work with the greatest success and made astonishingly quick progress, thanks to the good quality of its goods. The galoches were even soon sold

abroad, in spite of the immense internal consumption. In 1833 Kirstein's manufactory was consolidated with the Russian-American Company, which became so powerful that all smaller mills which sprung up from time to time were soon obliged to suspend operations. Thus in 1870 there were four mills, in 1871 there were only three, in 1872 three new mills were started and one of them, the Mackintosh, was bought up by the Company in 1880, whilst the others were closed. The success of this concern may be easily gauged by observing the increasing production of india rubber galoches; in 1860 to 1861 it amounted to 220,223 pairs, in 1870 and 1871 it rose to 1,804,634 pairs, and in 1880 and 1881 it was as high as 2,313,378 pairs. The demand for these goods abroad is a sufficient proof of their good quality; in 1870 and 1871, 57,207 pairs were sold in Germany and Sweden and in 1880 and 1881 the export rose to 269,437 pairs. The production in 1886 and 1887 amounted to 3,300,000 pairs of which 2,750,000 were sold in Russia, 400,000 were exported to Sweden and Norway, and 150,000 to Germany, Denmark and other countries.

During the struggle between this manufactory and its competitors the most formidable resistance was encountered from a manufactory in Livonia, the production of which was, however, greatly inferior to that of the Russian-American Company. Besides regular india rubber works which manufacture their goods from the raw caoutchouc and gutta-percha, there are many small mills which purchase ready made rubber and india rubber coated cloth from abroad or from Russian rubber works and manufacture elastic fabrics, and waterproof clothing.

The development of the india rubber trade during the second half of the decade, after 1880, is shown by the fact that in 1885 there were 2 mills with 1,750 hands and a production of nearly 7 million roubles, or, more exactly, 6,976,000 roubles, and in 1889 there were 9 mills with 3,273 hands and a production amounting to 10,300,000 roubles; besides this there are 2 mills in Finland, and their production in 1888 was officially returned at only 13,000 roubles. The following statistics prove that the trade is rapidly progressing in spite of the drawback of importing all the raw material.

In the government of St. Petersburg there is one large india rubber manufactory belonging to the Russian-American Company. It was established in 1860 with a capital of 500,000 roubles. In 1878 the working capital was increased to 2,000,000 roubles and a reserve fund of 1,400,000 roubles was added; the production amounted to 5,000,000 roubles and consisted of galoches and all kinds of rubber goods. In 1892 the working and reserve capitals were raised to 6,000,000 roubles. At present the capacity of this mill is sufficient for a production of 10,000,000 roubles. The plant includes 22 steam boilers, 25 steam engines of 2,120 aggregate horse power, and 380 rolling, washing and auxilliary machines; there are 2,873 hands of which 1,387 are women. Galoches and all kinds of india rubber articles are manufactured at this mill; the galoches are sold over all Russia and sent abroad in large quantities, the export being as high as 1,000,000 pairs.

There are two mills in the government of Livonia, possessing 9 steam boilers and 13 steam engines yielding 650 horse power. Their yearly production amounts to 645,000 roubles and they employ 510 men. Mündel's works in Riga were founded in 1864; they have survived a prolonged competition with the Russian-American Company; they manufacture galoches, surgical appliances, et cetera, to the value of 200,000

roubles a year, and employ 101 men. There is one india rubber manufactory in the government of Moscow belonging to the Moscow India Rubber Company, established in 1888; it has one steam boiler and 3 steam engines generating 250 horse power; its production amounts to 1,000,000 roubles and employs 370 hands. In Poland there are two small mills with 2 steam boilers and 2 steam engines with a total of 21 horse power; their united production is equal to 258,000 roubles, and they employ 180 men.

The rapid progress achieved by the Russian india rubber trade conveys the assumption that the import of foreign rubber goods should be steadily declining, and this is proved by the following figures.

| IMPORT OF CAOUTCHOUC GOODS: |         |         |         |
|-----------------------------|---------|---------|---------|
|                             | 1884.   | 1885.   | 1886.   |
| Pouds . . . . .             | 11,701  | 11,933  | 10,307  |
| Value in roubles. .         | 566,580 | 411,034 | 320,982 |

Statistics of the previous years show that the import reached its highest stage during the period from 1876 to 1881; in 1882 it began to decline and from 1884 shows a decided decrease. During the second half-decade of 1880 fluctuations again occurred, as shown by the following table.

| VARIOUS IMPORTS.   | 1887.           | 1888.   | 1889.   | 1890.   |
|--|-----------------|---------|---------|---------|
|  | R O U B L E S . |         |         |         |
| Pure gum elastic and gutta-percha goods . .                                | 266,094         | 234,671 | 251,036 | 268,012 |
| Gum elastic, thread fabrics . . . . .                                      | 5,840           | 2,885   | 3,599   | 2,922   |
| Gum elastic boots and shoes . . . . .                                      | 201             | 162     | 150     | 323     |
| Goods of gum elastic and gutta-percha mixed<br>with other matter . . . . . | 62,889          | 39,329  | 32,329  | 41,531  |
| Total . . . . .  | 335,024         | 277,047 | 287,114 | 312,788 |

The largest item is made up of the pure gum elastic and gutta-percha goods; next come those made of a mixture of rubber and other substances; gum elastic thread fabrics are imported in small quantities, and rubber boots and shoes only appear occasionally as an import. The total import does not amount to more than 3 per cent of the internal production.

The export of india rubber and gutta-percha goods increases as the import decreases. The following tables show, however, that this increase was not without considerable fluctuations.

The export of caoutchouc goods through the European frontier may be seen below, in yearly averages during stated periods:

|             | 1869—1875. | 1876—1878. | 1879—1883. | 1884—1886. |
|-------------|------------|------------|------------|------------|
| Pounds. . . | 2,795      | 12,275     | 6,881      | 10,596     |

The export through the European and Asiatic frontiers was as follows:

|            | 1884.   | 1885.   | 1886.   |
|------------|---------|---------|---------|
| Pounds . . | 21,286  | 22,493  | 22,327  |
| Roubles .  | 885,909 | 432,444 | 682,709 |

Thus during the space of 17 years the export increased eightfold, or from 2,795 pounds in 1869, to 22,327 pounds in 1886.

The next table shows the state of the export during the second half-decade of 1880.

| EXPORT FROM RUSSIA.                     | R O U B L E S. |           |           |           |
|---|----------------|-----------|-----------|-----------|
|   | 1887.          | 1888.     | 1889.     | 1890.     |
| Gum elastic and gutta-percha goods. . . | 371,400        | 157,299   | 55,836    | 186,242   |
| Gutta-percha boots and shoes. . . . .   | —              | 1,162,399 | 1,470,706 | 1,056,137 |
| Total. . . . .                          | 371,400        | 1,319,698 | 1,526,542 | 1,242,379 |

A still greater increase in the export of rubber and gutta-percha goods is shown in the second half of the decade, although accompanied by considerable fluctuations. The largest item consists of gutta-percha boots and shoes, which in 1889 amounted to 1,470,706 roubles, the total export for that year being 1,527,000 roubles. From 1885 to 1889 the production of the india rubber industry and its foreign trade increased from 6,976,000 roubles to 10,312,000, or about 50 per cent. During the same period the import decreased almost 30 per cent, and the export showed a rise of over one million roubles. At present the export is equal to about 14.8 per cent of the total production, and the import, about 2.8 per cent.

The produce of a large india rubber mill consists of materials and manufactured goods; the materials are, sheet rubber, semi-transparent, made out of raw rubber, rubber glue, which is a solution of raw india rubber in benzine, and india rubber thread. These materials are prepared from pure natural india rubber, and their cost is somewhat high; the glue, for instance, costs 1.50 roubles per pound, the sheet rubber, 2 roubles and the rubber thread, from 2.50 to 3 roubles per pound. Another material called horn rubber, or ebonite, is made by treating india rubber with a considerable quantity of sulphur at a comparatively high temperature and mixing it with litharge and lampblack; a compact hard substance is thus obtained which is capable of being planed, turned and polished, and is much used for making a va-

riety of goods. The price of ebonite is about 3 roubles per pound and does not depend so much upon the expense of the raw materials as upon the costly nature of the process of manufacture.

These materials are either used in the manufactory for making various goods, or sold to small factories and shops for making small rubber articles. These india rubber wares are of almost innumerable variety and may be divided into two groups as follows.

### I. Soft rubber and gutta-percha goods.

These articles are either of pure india rubber or else of india rubber mixed with other substances such as wood, metal, glass et cetera, or combined with hempen, linen, paper, woollen, jute and other textile fabrics. These goods are either: 1. articles employed in different branches of trade, such as belting, hose, hemp and waterproof sheeting, pump valves, buffers and carriage tires; 2. articles used in the sick chamber; 3. household utensils, such as pails, bags, sacks, photographic baths, mats et cetera.

These objects vary greatly in price; small articles of delicate workmanship made of quite pure rubber cost sometimes as much as 8, 9 and 10 roubles per pound; whilst commoner objects, not requiring to be made of absolutely pure rubber, cost far less; the mats for instance contain very little india rubber and sometimes do not cost more than 80 kopecks per pound. Valves cost about 2.50 roubles and syringes about 5 roubles per pound. The prices of soft rubber and gutta-percha goods depend far more upon the workmanship than the cost of the material, as for instance, balls, dolls and toys in general.

### II. Horn rubber goods.

These articles are polished and made of pure horn rubber, or combined with other materials; they are principally physical, chemical, astronomical, surgical and electrical apparatus and ornaments for furniture. These goods are generally very light and of elaborate workmanship, so that their price by weight is very high, about 2 to 5 and sometimes 10 roubles per pound.

By recapitulating the foregoing statistics referring to the india rubber industry in Russia up to 1890, the actual state of the trade is found to be as follows:

|   |                     |
|---|---------------------|
| India rubber manufactories, except Finland. | 9                   |
| Number of men employed . . . . .            | 3,273               |
| Production of rubber goods . . . . .        | 10,312,000 roubles. |
| Mean production per factory . . . . .       | 1,145,777 >         |
| Production per workman. . . . .             | 3,150 >             |
| Import of rubber goods . . . . .            | 287,114 >           |
| Export of rubber goods . . . . .            | 1,526,542 >         |
| Annual home consumption . . . . .           | 9,072,572 >         |

The export, here shown, exceeds the import by 1,239,428 roubles, or is 5.3 times as large, and amounts to nearly 15 per cent of the internal consumption.



## CHAPTER VIII.

## Wood Industry.

**I**N consequence of the abundance of timber in some parts of Russia, wood working has always been one of the most extensive industries, occupying large numbers of men and having an economical influence upon the life of the population. Dwellings, farm buildings, furniture, household utensils and agricultural implements are all principally made of wood in Russia, and therefore wood working is a well known trade to the greater part of the rural population, from time immemorial accustomed to handle the axe and other carpenter and joiner tools. Nearly the whole of Russia is studded with numerous village workshops, such as coach builders, coopers and carpenters, supplying the neighbouring and sometimes distant markets with their cheap and often excellent goods.

The greatest degree of development was naturally attained in those localities rich in timber; in some places where the forests are already largely consumed, the inhabitants still pursue their usual calling, the materials being obtained from other places. These cases are however rare as the village trades are mostly subordinate to the fundamental rural industry and the chief factors for determining the degree of development and future condition of the wood working trade in a given locality would therefore be the proximity of forest land, cheapness of timber and facilities of transportation.

In order therefore to arrive at a true understanding of the condition of the wood working industry in Russia, it is necessary to determine the degree of woodiness of its various districts. Great importance must also be attached not only to the general extent of forest lands, but also to that part of them which are under the direction of the Department of Woods and Forests, as being more thoroughly investigated, subjected to better cultivation, and, what is most important, sufficiently guaranteed from destruction. The following table, compiled from the latest statistics of the Forests Department of the Ministry of Crown Domains, shows the degree of woodiness of the different parts of Russia.

| Regions:              | Ratio of wood-land to total area of given region. | Total forest area in thousands of dessiatines. | Area of Crown forests in thousands of dessiatines. | Good forest soil in Crown lands in thousands of dessiatines. | Ratio of Crown forests to total forest area. |
|-----------------------|---|--|--|--|--|
|                       | Per cent.   |  |  |  | Per cent.                                    |
| Northern . . . . .    | 71  | 84,696   | 81,355   | 64,832   | 96   |
| Eastern. . . . .      | 45  | 41,557   | 23,495   | 18,729   | 56   |
| Baltic-St. Petersburg | 35  | 9,815  | 2,648  | 1,587  | 27   |
| North-western. . .    | 31  | 8,715  | 2,303  | 1,779  | 26   |
| Moscow Central. . .   | 38  | 13,938   | 3,326  | 2,822  | 24   |
| Central Chernoziom.   | 17  | 7,391  | 1,790  | 1,511  | 24   |
| South-western. . .    | 22  | 3,387  | 793  | 672  | 23   |
| Little Russia. . . .  | 11  | 1,616  | 300  | 214  | 19   |
| Southern. . . . .     | 2   | 1,212  | 204  | 138  | 17   |
| Vistula. . . . .      | 22  | 2,484  | 789  | 759  | 32   |
| Caucasus. . . . .     | 19  | 6,914  | 4,355  | 2,971  | 63   |
| Finland. . . . .      | —   | —  | 13,075   | —  | —  |
| Siberia. . . . .      | —   | —  | 106,929  | 22,808   | —  |

The data referring to the amount of suitable soil for forests are only given for those woods under Government administration, where the extent of favourable soil amounts to 79 per cent of the total area of Crown forests. If this percentage be extended to all forests, then the whole amount of suitable forest soil in Russia in Europe, without counting the governments on the Vistula and the Caucasus, amounts to 136 million dessiatines.

According to this table the forests lands in Russia amount to 41 per cent and the suitable forest soil is expressed by  $41 \times .78 = 32.4$  per cent. This last figure conveys the idea that Russia is a more richly wooded region than western Europe, which contains 28 per cent of woodland, Austria having 29, Germany 26 and France 16 per cent. Russia is however far too extensive to be regarded as a single element, and by dividing it into several separate regions and assigning the same proportion between favourable forest soil and total extent of forests as that given for the Crown forests, the following relations are arrived at. The northern region is found to be the most richly wooded, the forest land amounting to  $71 \times .8 = 57$  per cent of the total area; the eastern region with a woodland area of  $45 \times .79 = 36$  per cent, and the Moscow region, with  $38 \times .82 = 31$  per cent, follow next. The remaining regions are poorer in forests than Germany; the north-western region contains  $31 \times .77 = 24$  per cent, the Baltic-St.-Petersburg  $35 \times .60 = 21$  per cent, the Vistula region  $22 \times .96 = 21$  per cent, the south-western  $22 \times .84 = 18$  per cent, the Central Chernoziom  $17 \times .84 = 14$  per cent, the Little-Russian  $11 \times .71 = 8$  per cent, and the southern region about 1 per cent. If therefore the northern and eastern governments be omitted, as they supply but little timber to the other parts

of the country, Russia is found to be a comparatively poorly wooded country and many parts of it contain even less forest land than France.

Another circumstance of considerable importance is that the area of the Crown forests amounts to 67 per cent of the total extent of woodland, and this has a very favourable influence in preventing the destruction of forests which greatly assist in developing the resources of the country. There is a marked disproportion in the distribution of the forests with reference to their proprietorship; thus it appears that by far the greatest quantity of forests in abundantly wooded districts are owned by the State, whilst in the more poorly wooded regions this ratio is far smaller. Taking the mean ratio as 67 per cent, Crown forests in the northern region amount to 96 per cent of the whole woodland area; in the eastern region the Crown owns 56 per cent, in the Baltic-St.-Petersburg 27, in the Moscow and Central Chernoziom 24, in the north-western 26, in the south-western 23, in the Little Russian 19, and in the Southern 17 per cent. Finland is one of the most densely wooded regions of Russia; in 1888 the crown woods alone covered an area of 44,285 hectares or about 13,075,000 dessiatines, which is 45 per cent of the total area of Finland.

For want of requisite statistics it is impossible to determine with any accuracy the yearly consumption of wood in Russia. According to Professor Arnold each inhabitant uses about one-half a cubic fathom per annum, and as the amount used for building is about one-sixth to one-fifth of the quantity consumed, it follows that each inhabitant requires about one-tenth of a cubic fathom per annum for building purposes, and the total consumption calculated on this basis may be estimated from 8 to 10 million cubic fathoms a year for building alone. It is necessary to add, that in Russia nearly all the villages are composed of wooden houses and that the people, who originally settled only in the woods, have up to the present time but little notion of the preservation of forests, and consequently the consumption of wood in Russia is abnormally large.

The most common and by far the most useful tree of the abietic or fir tree species, which grows in Russia is the ordinary pine, or *pinus silvestris*. It is found in more or less dense forests in at least two-thirds of the whole extent of European Russia. The next most familiar tree of the same variety is the fir, *abies* or *picca excelsa* which is found in the northern parts of Russia. Besides these the Siberian fir, *abies sibirica*, the larch, *larix sibirica*, are much prized in the north-eastern governments, and in Siberia, the Siberian cedar, *pinus cembra*, is one of the best trees.

Of the foliate trees the following need only be mentioned. The birch is the most widely spread and is found in several varieties, such as *betula alba*, and *betula pubescens*, in most parts of Russia. The aspen tree, *populus tremula*, is almost as widely diffused as the birch. The lime, *tilia parvifolia*, is likewise very common in Russia in Europe, and the oak, *quercus pedunculata*, grows in many parts of central and southern Russia.

#### THE WOOD-WORKING INDUSTRY.

Notwithstanding the great extent to which wood working is carried on in Russia, the industry is principally of a simple and manual nature, only adequate to the local requirements. Most of the timber is bought in logs or sawn into planks and



deals in the woods and factories, and never enters the mills, of which alone a record is kept. The sawmill trade is in a backward condition and gives no idea of the amount of timber consumed, or the money turned over in the business.

With reference to the foreign timber trade, it must be first of all observed that Russia has from time immemorial exported a great deal of wood from the north and west, mostly in the raw or half-trimmed state, the export of manufactured wood being comparatively small. At the same time, joiner and cabinet maker's work is being imported into the country, although not in large quantities.

|  | EXPORT OF LUMBER AND WOODEN<br>WARES, EXCLUSIVE OF FINLAND. |            |
|--|---|------------|
|  | 1889.   | 1890.      |
|  | R o u b l e s .   |            |
| Oak beams . . . . .  | 362,440   | 391,571    |
| Pine ditto . . . . .   | 7,389,9   | 8,165,489  |
| Fir ditto . . . . .  | 1,459,231   | 1,421,392  |
| Various ditto. . . . .   | 428,769   | 723,046    |
| Foles . . . . .  | 272,994   | 196,404    |
| Facings . . . . .  | 9,066   | 10,665     |
| Joists, rafters, trusses, battens . . . . .                    | 4,945,863   | 4,558,424  |
| Planks, laths, sleepers, slabs. . . . .                        | 35,724,534  | 32,562,817 |
| Scantlings and shingles . . . . .                              | 34,624  | 26,365     |
| Posts, axletrees. . . . .                                      | 590,710   | 988,941    |
| Nut wood . . . . .   | 228,332   | 193,917    |
| Palm wood . . . . .  | 406,957   | 362,782    |
| Small unclassed hard wood . . . . .                            | 3,444,388   | 3,687,141  |
| Total export of raw and half-dressed<br>lumber goods . . . . . | 55,297,812  | 53,291,954 |
| Carpenter works. . . . .                                       | 75,493  | 102,316    |
| Joiners works . . . . .  | 243,213   | 284,171    |
| Turners and wood carvers ditto. . . . .                        | 28,906  | 61,175     |
| Various unclassed manufactured wooden goods . . . . .          | 229,090   | 435,674    |
| Matting . . . . .  | 122,996   | 138,646    |
| Total manufactured goods . . . . .                             | 699,698   | 1,021,982  |

The export of raw and half-trimmed lumber from Russia has therefore of late years amounted to 55 million roubles; about 40 per cent of this has been sent to Germany; 33 per cent, to Great Britain; and 6 per cent, to Holland et cetera.

The export of manufactured wooden goods is less than one million roubles per annum. The export of timber from Finland is estimated in the statistical reports by the number of cubic metres and amounts to about 1,333,333 cubic metres of building timber and light stuff, exported principally in planks and deals. Taking the average price of a cubic metre of sawn timber at only 10 roubles per, this export may be put down at 13 million roubles.

| I M P O R T.                                 | IMPORT OF LUMBER AND WOODEN WARES. |           |
|--|------------------------------------|-----------|
|  | 1889.                              | 1890.     |
|  | R o u b l e s.                     |           |
| Choice woods for turners and joiner work . . | 341,916                            | 497,092   |
| Various woods in sheets and veneer . . . .   | 85,009                             | 71,113    |
| Carpenters work . . . . .                    | 364,177                            | 335,566   |
| Joiners and turners work . . . . .           | 1,092,008                          | 1,269,388 |
| Unclassed lumber goods . . . . .             | 4,541,908                          | 4,698,801 |

Moreover, of late years wood pulp to the value of over a million roubles a year has been imported, also a like amount of resin which, considering the abundance of wood in many governments, might easily be manufactured at home, if only the wood industry were more developed in this direction. The statistics of the number of mills and manufactories engaged in wood working, and of their yearly production and number of workmen in Russia, exclusive of Finland, show a considerable development in wood working as a manufacturing industry. In proof of this it is only necessary to quote the figures for 1881 and 1891 in the following branches of the trade: saw mills, cabinet making and joining, turning and other various small work, mat making and wood-pulp manufacture.

|              | SAW MILL TRADE.  |                          |                  | CABINET MAKING AND JOINERY TRADE. |                          |                  |
|--------------|------------------|--------------------------|------------------|-----------------------------------|--------------------------|------------------|
|              | Number of mills. | Production in thousands. | Number of hands. | Number of works.                  | Production in thousands. | Number of hands. |
| 1881 . . . . | 516              | 15,418                   | 11,319           | 154                               | 2,584                    | 4,424            |
| 1890 . . . . | 631              | 21,566                   | 17,986           | 103                               | 4,301                    | 5,864            |

|              | TURNERY AND SMALL WORK. |                          |                  | MAT MAKING.          |                          |                  | WOOD PULP.       |                          |                  |
|--------------|-------------------------|--------------------------|------------------|----------------------|--------------------------|------------------|------------------|--------------------------|------------------|
|              | Number of factories.    | Production in thousands. | Number of hands. | Number of factories. | Production in thousands. | Number of hands. | Number of mills. | Production in thousands. | Number of hands. |
| 1881 . . . . | 53                      | 452                      | 513              | 69                   | 536                      | 4,997            | 3                | 65                       | 91               |
| 1890 . . . . | 62                      | 1,371                    | 2,739            | 78                   | 482                      | 5,532            | 19               | 521                      | 437              |

The saw mill industry is evidently the most highly developed wood-working manufacture, most of the mills being of fairly large size, furnished with power usually generated by steam, and employing a comparatively large number of hands. Their united yearly production amounts to more than 20 million roubles, whilst the export of beams, rafters, planks and other kinds of sawn timber exceeds 40 millions per annum or double the production of the saw mills, the remainder as well as the enormous quantity of timber consumed in the country is sawn by hand and therefore does not enter into the production of the manufactories.

The Russian cabinet making and joinery works engaged in the manufacture of furniture, inlaid flooring, doors, frames, packing cases, barrels, billiard tables, shrines, mouldings, et cetera, contribute only a small proportion of the amount of these goods consumed in Russia, the remainder being supplied by artisans working at home in the towns and villages. There are certainly some large mills worked by powerful steam or hydraulic motors carrying on this branch of manufacture, but their number is comparatively small.

The same thing may be said with regard to the manufacture of small wooden wares, such as boot pegs, boxes, umbrellas, toys, wooden buttons, reels and shuttles for weaving and spinning mills, wheels et cetera. It must be however mentioned that the manufacturing trade in small wooden goods is increasing every year and has multiplied several times during the space of ten years. The production of wood pulp, which is of great importance to the paper trade, has also rapidly developed. It is worthy of note that the government wood-working manufactories serve as an example for the further development of the industry.

The military technical establishments, such as the admiralties, arsenals, artillery workshops et cetera, are furnished with wood working machinery of the latest construction, and the manufacture of wheels, boxes and other wooden articles for the artillery and other departments is conducted in the most rational manner. The carriage works and railway shops are also provided to a great extent with efficient machinery, several of them being complete wood-working manufactories, by no means inferior to many foreign ones. The match trade, which is rapidly developing in Russia, also requires a good deal of working machinery for the manufacture of the sticks and boxes in large quantities. The pattern shops of large foundries are provided with machines tools, also the coach building, pianoforte and other manufactories which will not be discussed in this article. Even those mills and factories which manufacture

goods of other materials often use circular and band saws, hand-fed planing machines such as the universal wood worker and others for making packing cases, sawing wood and other purposes.

In Finland the wood manufacture is developed to a considerable degree and its proportions are steadily increasing. Thus, in 1879 there were 244 saw mills, 63 steam and 181 water power, employing 6,128 men, sawing 3,892,676 logs and producing 439,830 cubic metres of planks, 348,065 cubic metres of barge sheathing and 17,015 cubic metres of other goods. In 1888 the number of saw mills increased to 314 of which 117 were driven by steam and 197 by water power and employing 7,045 men, cutting 8,186,157 logs and producing 597,173 cubic metres of planks, 791,885 cubic metres of barge sheathing and 89,782 cubic metres of other goods. The total production of the wood-working trade in Finland amounts to 12 million paper roubles.

The village wood trade is highly developed, and at present of great importance as it enables a considerable proportion of the population of the Empire to earn a livelihood without removing them from the soil or their homes. All the investigations, made with the aim of studying village trades in Russia, show that wood is the most suitable material for the village craftsmen; as there is hardly a government in Russia, however deficient in wood, where there are no village artisans engaged in making the most common household articles from wood.

On account of the great importance of the village trade the Government, scientific societies technologists and other interested parties make every effort to improve the village handicrafts by organizing exhibitions, establishing suitable schools and removing all conditions unfavourable to its development, especially as the goods are not only remarkable for their cheapness and the national character of their design, but also eminently adapted to the particular requirements of the population. In consequence of the rise in the prices of wood in many places the Department of Woods and Forests issued a circular dated September 23, 1889, to all the administrations of Crown property permitting the sale of a part of the wood without bidding, not only to whole societies of peasants but to the separate groups of village craftsmen in order to enable them to acquire wood on easy terms, thereby supporting the wood-working trade in those places where there are not many forests belonging to private persons.

Almost the whole of Russia is dotted with numerous small wood-working establishments which generally make a specialty of one kind of work, which is often of an original character. In most cases the inhabitants of one village keep to the same style whilst those of another village manufacture a different article so that the class of work is rarely mixed in the same village. On the other hand the craftsmen of adjacent villages often subdivide the labour required in one and the same branch of the trade. Thus, in some hamlets of the Semenovsk district of the government of Nizhni-Novgorod the peasants carve out rough wooden spoons, whilst in another they are turned, and finally painted in a third, but not a single village or family turns out a finished spoon.

Once introduced into a given locality the wood-working industry generally clings to it, and if the wood in the neighbourhood becomes exhausted the artisans import it, even from afar. For purchasing their materials they generally unite into

strong corporations and send trusted travellers to buy or prepare the materials in distant places. The manufactured goods are rarely sold at home but most often taken to the fairs, where they are either sold directly to the consumers or to middlemen who sometimes dispose of them in distant places.

The wares of cartwrights and carriage builders are principally of the roughest description and remarkable for their cheapness. The colonist wagons of the Novorossisk district and the tarantasses of the Viatka district are however of excellent quality. In the village of Pogorelka of Shouisk district in the government of Vladimir the peasants manufacture 2,000 sledges made of juniper wood. In the districts of Khvalynsk and Kouznetz, in the government of Saratov, the cartwright trade is highly developed and a quantity of carts, axletrees, sledges, wheels, tires and shafts are made. The village of Koutoshikha in the Valdai district of the government of Novgorod makes a specialty of wheels; the tires are principally bent out of the poplar, felled from August to March, as that cut in spring and summer is not strong enough for tires. Willow is also often used instead of poplar for tires, because they are better and stronger, so that wheels made with willow tires are the more expensive; nevertheless by far the greater quantity are made of poplar as thick willow is now rather hard to find. The naves of the wheels are made of birch, alder or likewise of poplar. Birch is the best wood for this purpose and next, alder. When ready, the naves are coated with hot tar to increase their strength. The spokes are principally made of mountain ash, sometimes also of birch; the former are preferred as they are stronger. A pair of wheels with poplar tires cost 1.50 roubles, and a pair with willow tires, 2 roubles.

It would be impossible to enumerate here all the villages engaged in the cartwright trade on a large scale, but one particularly Russian branch of the industry may be mentioned, namely the manufacture of *dougas*, (shaft bows) which is carried on in many places, one of the principal centres being the village of Kroutoi-Log in the Belogorodsk district of the government of Kiev, where it has existed for a very long time. In former times the Belogorodsk dougas were famous in the south of Russia and were eagerly bought up at the fairs. Later on when the railway lines brought about a decline in the carrier trade, the shaft bow business became slack and the demand for them in the southern fairs fell off so that new markets had to be found, such as Moscow and the regions beyond the Urals. These shaft bows are made of *cytissus* logs which are principally purchased from landed proprietors, and sometimes from peasants. It is curious to note that in some parts of the government of Kursk and in the border villages of the government of Voronezh and Kharkov the peasants are cultivating a special kind of tough *cytissus* to sell to the maker of shaft bows, and it seems to be a profitable undertaking as the wood grows rapidly and does not require much attention.

The cooper trade is as widely spread as that of cartwrights and has attained considerable development in the governments of Viatka, Riazan, Tver and Novgorod. In 17 villages out of the 21 in the Yasenovsk volost in the Vyshnevolotsk district of the government of Tver nearly all the peasants are coopers, who in the latter locality principally use fir wood, although utensils made of red pine are more expensive. They manufacture butter tubs at 5 kopecks a piece, kegs at from 8 to 10 kopecks according to size, double-botommed wooden vessels, all kinds

of wash tubs, baskets of linden bark, all being about equally profitable, the daily work of each cooper being represented by goods to the value of 50 to 60 kopecks. After subtracting a few kopecks for material, the clear profit amounts to about 2 roubles a week. The village of Valtyrev in the Borovitchevsk district of the government of Novgorod also produces a large quantity of various utensils, such as tubs, ladles, kegs, pails et cetera, these goods being famed not only for their strength and neatness but even for their artistic designs. The pails at 20 kopecks a pair, and ladles at 5 and 10 kopecks apiece, are much admired with their juniper wood hoops and attractive appearance. The Valtyrev utensils are made of fir wood, brought down by floatage and purchased in logs on the river Msta at a distance of 5 versts from Valtyrev. A log, 3 sages long and 5 vershocks thick at the top end, costs 75 or 80 kopecks and is sufficient for making 5 tubs 1 arshine high costing 65 kopecks apiece. Pine logs cost about the same as fir.

The wooden ware manufactured in Russia is of many kinds and many of the articles are necessary for the other village industries. Many districts, for instance, manufacture large quantities of reeds, the Pashinkovsk group of villages in the Egorevsk district of the government of Riazan alone produces as many as half a million birchwood reeds a year. In the government of Tver in the villages of Koushalin, Naidensk and Velshin there are about 240 households carrying on the trade. The reeds are made of wood, which is purchased in loads, of logs 1.5 arshines long. In a good load, costing 2 roubles, there is sufficient material for making 250 reeds. At the present time the middlemen pay from 5 to 20 kopecks per reed according to the make, but the average price is from 12 to 14 kopecks. The reed makers do not work more than six months in the year, and a man will make about 200 per winter. They are also made in the village of Okhlopkov in the Arzamask district of the government of Nizni-Novgorod and in many other places; they always meet with a ready sale as they are indispensable to the village weavers.

The production of spinning combs is also considerable and principally centred in the manufacturing governments, especially in that of Vladimir, although the maple wood out of which they are made is brought from the forests of Kalouga and often even from the western governments. In the Shouisk district more than 250 men are engaged in making these combs, the yearly production being about 70 pairs per workman. Spinning wheels are made in the Medynsk district of the government of Kalouga and the local sheepskin dressers, of which there are about 10,000 men, when setting out to work in the Crimea or the Caucasus, take a large number of spinning wheels with them in pieces. The skillful artisans of the village Velikoe in the district of Yaroslav are famed for their spinning wheels; their production amounts to over 1,500 wheels a year. The manufacture of weaving looms is also carried on here and in many other places. In the village of Leytnevo in the Shouisk district there are twenty-five households engaged in the manufacture of harrows, their production amounting to 3,000 pieces a year; they are made of fir wood, with juniper rings and oakwood teeth.

Wooden packing cases form one of the principal specialities in joinery; they are generally made of alder wood, on account of its lightness, and are much used for packing goods to be sent to the far East. To facilitate the transport of the empty cases, they are usually made of different sizes to fit into one another. The

principal centres of the packing case trade are the Makarievsk district in the government of Nizni-Novgorod, the Bagrationovsk villages in the Mouromsk district of the government of Vladimir and also the Verkhotoursk and Ekaterinburg districts, of the government of Perm.

The manufacture of bent cherry furniture is carried on in the Kosmodemiansk district of the government of Kazan; the material consists principally of sticks in the bark about one-half to three-fourths of an inch in diameter, and 2 to 3 arshines long; the wood generally comes from a distance and costs at present about 35 kopecks per hundred pieces on the spot. One chair takes 25, and an arm chair, about 30 sticks. These chairs made to order cost 6 roubles a dozen and the arm chairs, 80 kopecks to a rouble apiece; footstools, sofas and tables are also made there. This furniture is made in a very simple way; the fresh cherry sticks are pared with a knife and then carefully bent across the knee; when properly curved the stick is tied up with bast and put away to dry, after a short time, the bast strings may then be removed without fear of the sticks straightening out again. Before being bent they are always stored in a damp place; any sticks which may have become dry require to be steamed or steeped in water before they can be used. The rods which are gathered in June and August are generally discarded, as when peeled they do not turn yellow, and the furniture which acquires the deepest natural yellow tint is most prized. The seats of these chairs are made of thin oakwood boards. The production of this district amounts to about 1,100 dozen bent cherry wood chairs a year, of which about 500 dozen are sent to Moscow and the remainder sold in the towns along the Volga. In the government of Viatka there are as many as 600 village joiners with a united production of 140,000 roubles. Their wares consists of boxes, frames, cases and many other articles, the furniture being worthy of particular attention, on account of its handsome appearance, strength and cheapness; the chairs are particularly cheap the painted ones being sold as low as 9 kopecks apiece.

In many parts of the government of Moscow the village artisans make carved furniture which in artistic design and quality can compete with the best goods of the kind. This furniture finds its way into the hands of the middlemen in Moscow who put foreign trade marks upon it and pass it off as imported goods.

Carpentry is not such a popular trade among the village workmen; there is however a considerable business done in window frames in the villages of Pourekh and Gorodets in the Balakhninsk district of the government of Nizhni-Novgorod, also in the districts of Syzran in the government of Simbirsk, of Gorbátovsk in the government of Nizhni-Novgorod and Kotelnichesk in the government of Viatka, and especially in the village of Gadovka in the Simbirsk district, whence the goods are conveyed as far as the Caucasus, the Don, Orenburg and Siberia. Wooden doors for cottages are made in the Kassimovsk district of the government of Riazan and the sale of wooden cottage walls is also often carried on here. In the village of Tseliava consisting of 20 homesteads in the district of Borovichi, almost all the peasants are engaged in the making of canoes of poplar wood; these boats, 12 vershocks thick and 3 sagesnes high, carry 6 men and cost from 5 to 6 roubles. The inhabitants of the large village of Radoul, situated near the Dnieper in the Gorodnitsk district also occupy themselves with boat building in connection with their usual calling of float-

ing timber down the Dnieper, which occupies all the able-bodied men of the locality during the summer months, so that they are only able to devote their energies to boat building in winter.

The manufacture of wooden spoons is worthy of particular attention and is concentrated principally in the Semenovsk district of the government of Nizhni-Novgorod; the chief material used is birch, and small quantities of poplar, maple and palm, the latter three being imported. In the Semenovsk district this industry occupies 7,000 men. A load consisting of one-tenth of a cubic fathom of birchwood is sufficient for making 400 spoons, and one man can make 800 pieces per day; the total production attains the enormous figure of 126 million spoons a year, necessitating the consumption of 30,000 cubic fathoms of birchwood. The spoons are sold from 6 to 8 roubles per thousand. All the goods are sent to the village of Gorodets on the Volga and thence to Nizhni and Irbit, penetrating as far as Persia, Khiva, Bokhara and Khokand.

Small wooden goods are made in great quantities and often with considerable perfection, although the rougher class of goods are more important being produced in greater quantities. Child toys are made in the village of Bogorodsk in the district of Alexandrovsk in the government of Vladimir and the neighbouring settlements, 600 men being engaged in the trade. The parish of Petropavlovsk in the government of Viatka is noted for fine wood carving; a good deal of small turnery of different kinds is done in the districts of Shadrinsk and Ekaterinburg in the government of Perm, in the Zvenigorodsk, Bronitsk districts of the government of Moscow.

In the Kstinsk, Troitsk and Pomzinsk villages of the Viatka district the peasants turn out as many as 30,000 pipes, 15,000 pipestems and 10,000 candlesticks and saltcellars. Pipes are also made in large quantities in many colonies in the government of Saratov, about 250 men being engaged in the trade; the maple wood used for this purpose comes from the regions beyond the Volga.

Counting machines (*schety*) are made in the Veraysk district in the government of Moscow, about 30,000 of them are sent to the Ukraine fairs alone. Since 1884 wooden mosaic work in tables and boxes has sprung up in the village of Maklakovo in the Vasilsoursk district of the government of Nizhni-Novgorod, the whole of the village being engaged in the trade, which has now reached a highly artistic state of perfection. Most of the mosaic workers of the village of Maklakovo use wood artificially stained in various colours in default of naturally coloured varieties, and this of course diminishes the intrinsic value of their work. About 10 of them however work in naturally coloured woods which they obtain with some difficulty, and at rather high prices, from a joiner in Nizhni-Novgorod. These different coloured woods are principally made up of old cigar boxes or the cases in which paints, groceries and other articles are brought from abroad.

The district of Tula is famed for the manufacture of concertinas, the work being divided among at least seven distinct classes of artisans. This industry has been in existence about half a century and the production averages about 240,000 instruments a year; they are sold in Moscow, Nizhni and the Ukraine; the recruits buy a large number, and the Armenians, Persians and Bokhariots are likewise very fond of them. Concertinas are also made in the Viatka, Orlovsk, Kotelnichetsk and



Malmyzhsk districts of the government of Viatka. Very fine toned instruments of this kind called fis-harmoniums, with as many as 22 notes, are made in the villages of Istobensk and Khlimovka; they cost about 40 roubles and the Viatka merchants sell them as foreign goods at 150 roubles apiece. Organs and violins are made in the village of Velikoretsk in the government of Viatka.

Very original and quaint looking objects are made from the excrescences of birch which have a very pretty undulatory or veined section with a pearly or rainbow like lustre. The excrescences of the birch trees alone are used as they are the toughest and most beautiful, and also the most easily worked. These goods are only made in considerable quantities in two places, one in Slobodsk and the other at Viatka. The hinges made whole for box lids and cigarette cases are very curious and are much appreciated at home and abroad by amateurs of this peculiar kind of carved wooden work, which is also remarkable for its cheapness.

The basket-making trade is considerably developed in many parts of Russia. Quantities of baskets are made of willow twigs in the Tauride, Tver, Kazan, Kiev and other governments; in many other places, as for instance, Strelitsa in the Vessieghonsk district of the government of Tver pine splints are used for the purpose. This industry is frequently met with on the banks of the Dnieper in the government of Kiev, and as a supply of willow twigs can be obtained without much difficulty and the baskets are in great demand for transporting the local garden produce, the trade is very likely to thrive and is quite in accord with the character of its surroundings. The willow groves along the banks of the Dnieper are regarded as the common property of the peasants, and the rural authorities do not demand any payment from those who collect the boughs, but at the same time exercise strict control over this precious raw material, forbidding it to be cut during certain periods of the year and posting keepers round about it in summer, charged to watch over the interests of the community. The gathering time on the meadows and islands by the Dnieper generally commences on the 15th of July, when all the basket makers of the district set out to cut boughs, which they immediately peel and tie into bundles, each man being able to cut and peel about 3 to 4 thousand pieces per day. These sticks are then taken home, placed in rows, dried in the sun and put away in barns or storehouses. The basket makers, principally women and lads, are able to make about 4 large baskets a day, and earn about 30 kopecks. The trade is principally located in the villages near Kiev, but is rapidly spreading to other parts. The production of the basket-making industry in the government of Kiev is not only sufficient for conveying fruit to the northern parts of Russia but also for supplying the government of Bessarabia for the transport of garden produce.

Baskets are also manufactured of pine splints in the village of Ilmovits in the government of Novgorod. These splints are chipped from the butt logs, 12 or 13 quarters long, cut from 2 to 4 vershock pine trees, felled in woods belonging to the peasants. The butt logs are used, as they give clean wood free from knots, and small sized trees are selected as the larger sizes are used for building purposes, and would be too expensive for basket making. As soon as the logs are brought from the woods they are split into four pieces and rived while fresh into splints. One 4-vershock log, 13 quarters long, is sufficient for making 6 baskets

1 arshine high, 1 arshine in diameter at the top, and three-quarters of an arshine square at the bottom. A 2-vershock log of the same length will make 2 such baskets. They cost 20 kopecks apiece. Linen baskets 1 arshine long, 6 vershocks wide at the bottom, and 12 vershocks at the top cost from 7 to 10 kopecks. In many parts of the government of Viatka very elegant baskets, vases, sugar basins and other articles are made of the roots of young fir trees. Besides this, fishing and hand baskets are made there of straight willow shoots, also flat baskets for carrying fuel, snow, manure and refuse, are made of willow branches and young stems, also tarantass and sledge frames of thin cherry stems.

The preparation of lime bark is a peculiar and considerable industry, especially that of the internal or bast layer. Stems from one-half to one and one-half vershocks thick are used for making lime bast. They are felled in spring, in the sap, and the bark is removed by means of an iron hook; the outer layer of bark is peeled off with a knife and the soft, thin bast is cut into ribbons one-half a vershock wide. The work of stripping the lime bast is generally done in the woods, but sometimes the peasants take the stems home and strip off the bark in doors. The stems are sometimes, although rarely, cut in winter and are then steamed in the warm cottages. The lime bast is tied into bundles for sale and sold by the bundle, which generally contains 60 pieces or sometimes 100 of the finer or only 30 of the coarser sort, although such a half-bundle will cost more than an ordinary one of 60 pieces. The pieces are mostly 3 arshines in length; longer pieces are rare and are sold singly. The lime bast is used for plating shoes; each pair takes 12 pieces and as each sapling only yields 3 or 4 pieces every pair of shoes requires 3 or 4 saplings. These shoes are worn by most of the inhabitants of northern and eastern Russia, so that the consumption of lime bast is indeed enormous. The greater part of these shoes are made at home by those who require them, and for the most part by the oldest members of each peasant family, incapable of any other work. Sometimes, however, this industry is concentrated, as for instance, in the village of Smirnov in the Ardatov district of the government of Nizhni-Novgorod where about 300 men are exclusively engaged in it; each man is able to make 400 pairs in a winter. The goods made by the peasants of the villages of Nouchi and Ouzhovka in the same district are sent to the governments of Tula and Voronezh. The village of Semenovsk near Kineshma manufactures 100,000 roubles worth of bast shoes, which are sold over all Russia. The lime bast trade in the Mordos villages in the Shouisk district is very considerable as from one settlement alone, called Myt, 500 thousand pairs of bast shoes are sent to Moscow. Other lime bast goods, such as boots and hats, are manufactured in the government of Kazan where the village workmen are noted for their great skill, their goods being bought up very readily on the local markets.

The larger sized trees are taken for making bast wisp. For this purpose they are felled in late spring or early summer when the warmth of the air and the juiciness of the cambium tissue facilitates the removal of the bark. The tree is felled and placed across two logs, circular incisions are then made in the bark at a distance of  $6\frac{1}{4}$  arshines apart, the usual length of the bast wisp. Longitudinal incisions are then made in each division and the bark is removed either by hand or with a sharp wooden trowel about two vershocks wide. One man is able to strip

15 trees per day, while a second removes the bark to the steeping place. The transport takes place in summer through unfrequented, roadless places often encumbered with wind-felled trees and other timber, and cannot therefore be effected on wheels, but by means of trucks composed of two small fir trees inserted into a block of wood with their ends raised and joined in the middle by a cross piece. The horse is attached to them as if to shafts and the bast is loaded crosswise. The steeping places are the woodland rivulets, lakes, gulfs and even deep ditches in the marshes. For transport the smaller tubular layers of bark are placed inside the larger ones, making rolls of 3 to 6 pieces. These rolls are plunged in water and the bark is allowed to steep for one and one-half to three months, according to the temperature of the air, and the thickness and size of the bundles. The steeping separates the outer layer of bark and softens the bast, which parts with its viscous matter and resolves itself into threads or wisps. This process is very important and care must be taken to select a suitable spot, that is, a warm and abundantly watered place; dams have even sometimes to be made to preserve the water in the heat of summer. When removed from the water the bast is laid on the bank with the bark downwards, cleaned with a swab and washed. The bast may be then separated without difficulty by hand, although some skill is required; it is then put to dry on stakes in the woods and taken home before the commencement of winter. One medium sized lime tree, about 4 vershocks thick and 4 sages high, will yield about 15 pounds of bast wisp; working 2 months in felling and steeping, one month in removing the bast from the steeping places and one month in transport, two men with one horse will make about 280 pounds of bast wisp.

This material is principally used for weaving matting and sacks, in special looms which the peasants erect in their back premises; these looms are provided with reeds consisting of rows of flat wooden teeth inserted between straight wooden boards. Two men are occupied in weaving whilst a third separates the wisp into narrow ribbons and sorts it into the weft and the warp which latter is made of the best kind, that is, the long, thin and tough ribbons; three men are able to weave 20 mats or 15 sacks sewn together in a day. The mats are of various kinds, depending upon the place where they are made; one pound of bast wisp will produce from 5 to 12 mats according to size. The sacks are made in three sizes, heavy sacks holding 9 pounds of rye flour, light sacks, holding 5 pounds, and medium sacks; one pound of raw material will yield from 5 to 7 sacks.

The bast wisp industry in Russia is very large; in the government of Viatka alone about 500 thousand trees are felled for this purpose and 900 thousand sacks and 600 thousand mats are produced with a total expenditure of 340 thousand working days. The Vetloujsk and Varnavinsk districts in the government of Kostroma produce 100 thousand pounds of bast wisp occupying 700 men during a period of 4 months; besides this, 650 men are employed in making mats and sacks. The shangsk mats, of the Louginin make, are the most celebrated and are even known in England. About 200 thousand pounds of bast fibre is made in the Ufinsk and Birsk districts of the government of Ufa. No less than 200 thousand mats and double mats are manufactured in the government of Penza; in the Kochkourovsk and Giropinsk bailiwicks in the Loukoyanovsk district, 500 sacks are manufactured for Morshansk. The chief trade of the inhabitants of that part of the Makarievsk district which lies

beyond the Volga in the government of Nizhni-Novgorod consists in the manufacture of bast fibre goods for the traders of the settlement of Lyskov. A good deal of bast fibre is prepared in the government of Minsk for Riga.

The coarser kinds of bast fibre and lime bast are used for making tackle for rafts. On the Vetlougá alone 15 thousand pouds of bast fibre are used for 1,500 rafts. Lime bark as well as bast fibre is used for roofing, generally in pieces 3 arshines long, which are used for covering boat cabins and also for making hampers or cases, almost all drapers goods in Russia being kept in such boxes; Riga receives this material from the western governments; the Moscow market is supplied from the Veraysk district, the Shouisk district makes them at home. In the Vejsk district in the government of Vitebsk a large quantity of round boxes are manufactured; in the government of Kostroma alone 50,000 bast baskets are made. Bast is also used in large quantities for making sieves in the government of Kalouga. At Zimenchina in the Kovrovsk district of the government of Vladimir 500 men are engaged in making bast sieves; their production amounts to 1,500,000 pieces per annum; the raw material comes from the governments of Nizhni-Novgorod and Tambov.

In general the manufacture of this class of goods is located in particular centres at a distance from those places where the raw material is produced. Thus in the village of Grigorovo in the Melenkovsk district of the government of Vladimir there are 300 men engaged in weaving mats of imported bast fibre. The Orlovsk district of the government of Viatka which does not possess any lime trees, has distanced all the other districts in the mat and sack trade and works up 85 thousand pouds of bast fibre, part of which is conveyed to the fairs of the village of Onny from the Malmyisk and Glasovsk districts and from the government of Perm, and the remainder is floated down the river Viatka from the Menzelinsk district of the government of Ufa.

#### THE PITCH AND TAR INDUSTRY.

The distillation of tar is one of the oldest trades in Russia and is up to the present time centred in insignificantly small establishments where the owner is at the same time workman and salesman. The production of these works varies from one to three thousand roubles a year; larger works are rarely met with, and there are very few indeed which have a production of more than 15 or 20 thousand roubles a year.

Even in ancient times the products of the pitch and tar industry not only sufficed for the internal requirements of the country, but also for export; thus when Novgorod belonged to the Hanseatic League, pitch was an important item in the export trade and was obtained from the northern appanages of Russia. At the present time pitch is principally exported to England from Archangel where it is one of the principal articles of trade; turpentine is sent to Germany from the Baltic ports and overland. Of late years in the western governments and those by the Vistula large quantities of pitch and turpentine are distilled from the stumps left after the clearance of woods. This turpentine is in great demand in Germany on account of its good quality and cheapness.

Pine wood is almost the only material used, the most resinous parts being the stump and roots. In order to facilitate the uprooting and increase the resinous quality by decomposition the stumps are allowed to remain some 10 or 20 years in the ground before removal, and the best parts of the tree are the long vertical roots. The roots are dried in the air or even in special drying rooms, as it is a well known fact that the products are not of such good quality when damp material is used. When using the trunks of trees the distillers readily select those parts which are accidentally filled with resin especially where the fungus *æcedium pini* has injured the tree and produced an amassment of resinous matter. Not very long ago, even in the government of Vladimir, they used to fell a tree in order to obtain one resinous log, but the increased cost of wood has rendered it unprofitable to use timber in this way for distillation. Rotten old fallen trees are also used, and these may be of great value, if they are of ancient growth as is the case in the woods of the Sarovsk desert in the government of Nizhni-Novgorod. In order to increase the resinous qualities of the wood it is the custom in the governments of Archangel and Vologda to strip the pines; this is done by tearing a strip of bark 2 or 3 arshines long from the growing tree, first on one-quarter of the girth, and the following year on the next quarter and so on, in consequence of this the tree continually dries up and resinous matter abundantly comes out of its wounds; this is scraped off in the form of white resin or wax and the lignin is used for distillation.

The products of dry distillation are various, the most important being tar, an oily liquid consisting principally of a solution of pitch in turpentine, oil and creosote. The further treatment consists in separating the bitumen from the volatile oils. When distilled the pitch remains behind in the form of a hard body and the volatile oils carrying over a portion of the resinous matter condense in the cooler in the form of turpentine, red, yellow or white, according to its degree of refinement. The latter is obtained by completely eliminating the tar, but the creosote cannot be entirely removed and therefore the best colourless turpentine has a disagreeable smell. Turpentine without any odour can only be made from white resin. The hard product, corresponding to pitch in the distillation of tar is colophany or common rosin. Russian colophany, being carelessly prepared, is not of good quality and therefore instead of supplying this article to other countries, a considerable quantity is imported, as the development of the soap boiling and paper making trades necessitates a large consumption of it. Of late years, however, serious attention has been given to the proper way of making rosin. In 1872 the Department of Appanage, recognizing the importance and utility of this branch of trade, organized extensive works in the district of Velsk, government of Vologda, where especial attention was given to the production of tar. There is no doubt that owing to the introduction of such regular methods of collecting tar in the forests of northern Russia, and since the production of rosin has been founded on more rational bases, foreign rosin will not only be thrown out of use in Russia, but later on will even be replaced by the home product on the foreign markets.

The rosin produced from tar is a liquid, called *sourovitsa*, or tar water. From this liquid *metilov* spirits and wood acetic acid are produced, more frequently the latter. Wood acetic salt is fabricated not only in large chemical works, but in

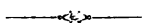
Yaroslav and other governments it is an industry of the people. In the district of Kineshma, government of Kostroma, there are about 30 small peasant fabrics, where wood powder (dry acetic lime) is produced from wood acid by a process of dry distillation of birch wood. The manufacture of wood acid has greatly developed since the industry began several years ago, as much of this acid is used in the chintz manufactories. The product is prepared according to regular and scientific methods and is therefore of good quality.

As to the technical means used for producing tar they are, in many localities, very primitive: the tar is burned in ditches dug in the earth, and very often much of the tar serves at the same time as fuel. Little by little more improved methods are adopted, namely, the *korchazhni* (earthen pot), the *kazani* (kettle), thus giving the name to the processes. In former times earthen pots, set in the ground, were used, and later, iron kettles set in the ovens came into use. The latter has become the predominating method at the tar works, although it is often replaced by another, where tar is produced in kettles of sheet iron, set at different angles in the ovens.

Although the tar industry is almost exclusively in the hands of the peasants, nevertheless, it has shown great improvements in recent years in technic, in the construction of the apparatus and condensers, as also in other economic processes, among which may be mentioned the use of other material for fuel, especially coal. This development has been attained by the peasants themselves, as learned technologists have paid little attention to the tar industry.

Still more independent is the occupation of making pitch, an industry that is especially Russian. In spring the thin upper bark is stripped from birch trees, either when the trees are standing or after they are felled; by means of distillation in simple apparatus, in many places by burning the wood in ditches, pure pitch is produced. It differs from tar by the complete absence of turpentine, contains less creosote and much more paraffine. As birch bark is much dearer now, pure pitch cannot be used for greasing leather and for other home necessities. Therefore, the Russian peasant has invented another surrogate as a substitute in leather dressing, which differs very little in its exterior from pure pitch. It is called *polovinchik* (half-pitch), and is produced through distillation of tar mixed with some birch or aspen bark. This product has lately attained great development, especially in the forest regions of Russia; thence it is sent to the steppes and is called *degot*.

The statistics of the tar industry are rather complicated. It is estimated, however, that the Russian forests produce yearly about 4,000,000 pounds of pure pitch and of *polovinchik*, about 2,000,000 pounds of tar, 150,000 pounds of resin and 60,000 pounds of turpentine, to the value of 8,000,000 roubles, including the charcoal, produced at the same time. This industry consumes yearly about 320,000 cubic sages of stumps and roots (*osmol*), about 100,000 cubic sages of wood and 2,000,000 pounds of birch bark, so that the total consumption of wood amounts to 600,000 cubic sages, that is, the yearly growth of 1,500,000 dessiatines of forest.



## CHAPTER IX.

**The Metal Industries.**

**T**HE manufacture of articles from metal for the trade has been a prominent industry in Russia for many years, even antedating the reign of Peter the Great. This statement is confirmed by the fact that many articles bearing inscriptions have been preserved to this day, as well as by many written documents, amongst others the court rolls. Thus, the fabrication of bells began in Russia soon after the introduction of christianity. The forging of side arms of different sorts should be classed among the most ancient, and was especially developed during the civil wars between the Russian princes and frequent wars with nomads and Tartars. Finally, owing to the Russians being a very religious people, who in their most happy as well as most unhappy moments were always building churches and decorating them, the industry of making church ornaments and ikon trimmings of precious metals also dates from very ancient times. At the end of the seventeenth century this industry attained such development that Peter the Great found it necessary to stamp silver and gold fabrications, in order to protect their quality.

But the small quantities of gold and silver, as also of other metals, of which the principal are copper, iron and steel, produced by Russia, retarded the free development of these manufactures, centralizing them principally near the Imperial palaces, as all the metal produced in Russia, and imported, was taken there to be stamped. Thus Moscow was the principal centre of the Russian metallurgical industry before the reign of Peter the Great; the best gun makers and goldsmiths were there; amongst them were many experienced foremen who came from abroad under special invitation and inducements of the Government.

During the reign of Peter the Great, namely, from the beginning of the eighteenth century, the metallurgical industries attained a remarkable development, owing to the genius and interest of that great Emperor. He founded several metallurgical manufactories especially iron works, the principal locality for such being the Urals, rich in extensive veins of different metals, and in large areas of forests of fir trees,

which gave charcoal, especially suited to metallurgical purposes. The most ancient factories were those of Neviansk and Kamensk, situated in the district of the Urals, government of Perm, the first being founded in 1699, and the second, in 1701.

Furthermore, for supplying the wants of the army, Peter the Great organized similar works at the other extreme of Russia simultaneously with the founding of St. Petersburg, and in the same vicinity; these manufactories were the Souoyarsk, founded in 1704, in the government of Viborg, and the Konchozersk, in 1707, in the government of Olonets. In 1719 iron works were founded in Istia in central Russia, namely, in the government of Riazan. It must be observed, however, that in the central and northern parts of Russia, as for instance, near Tula and Veliki-Oustug, already in the sixteenth century iron was fabricated from veins in the so-called *doushnitsi*, by means of hot blast and mixing the vein with coal and flux.

The Urals which, till the beginning of 1870, were the principal points of the different metallurgical productions, have always been the chief source of metal supply for the different trades, which were grouped in the localities, more or less in the near vicinity. The rivers Kama and Volga served as natural routes to convey the Ural metals to the central governments of Russia; therefore, many of the metallurgical industries, chiefly of a household character, have taken root on their shores. The fair of Makarievsk and later on, that of Nizhni-Novgorod, which were the collective points and trade centres for the sale of Ural metals, had also a great influence on the development of many industries in localities adjoining them by convenient ways of transport.

The present Russian metallurgical industry can be divided into two groups which differ greatly one from the other: the first belongs to manufacturing and the second to home industry. The latter occupies as to its production a very considerable place, notwithstanding the fact that its technical work is generally by hand; it can, however, compete with some of the products of the manufacturing industry, as some of its articles designed for sale are of excellent quality and workmanship.

The reason of the above fact lies in the conditions of the life of the Russian peasants. Possessing land, which is the principal source of their sustenance, they and their families give all the care possible to farming and their spare time only is devoted to some trade. The long winters, especially in central and northern Russia where the different industries are mostly centralized, have a great influence on the development of the home trades. After long and varied experience in working during the winter season the peasant becomes very skillful at his trade and turns out various forms of hand work very rapidly. When the peasant comes to fix the prices of his wares, he takes into consideration principally the cost of the materials adding thereto the cost of his living and a trifle only for his labour and time spent in their manufacture. In the sale of his articles he earns somewhere from 1.50 to 2.50 roubles, and rarely 3.50 per week. By making door and cupboard locks, the expenses for the material, of a Tula locksmith, form a little more than half of what he earns, and one-tenth for mending his instruments, so that his gross profits are only two-fifths of the value of the article. Although such conditions cannot be considered as very favourable to the producer they still not only uphold the domestic industries but also aid the manufactories by producing articles in a half-finished condition.

The money which the peasant earns in this way improves the conditions of



his life and gives him supplementary means for paying the taxes imposed by the Zemstvos and the Government. Therefore the Ministry of Domains takes all sorts of measures to sustain and improve these domestic industries. These measures, which consist in the collection of good samples of the different trades, in facilitating the means for producing raw material and in the establishing of regular agents between the producers and the wholesale dealers in these manufactures, in order to do away with the pressure of the middlemen, have a very favourable influence on the home artisans as well as on the industries themselves. Trade schools which are being constructed at the present time, and which will contain drawing classes, will also tend much to the improvement of the domestic industries.

In order to facilitate the description of the metallurgical industries it is necessary to divide them into sections, as follows :

1. Products of the noble metals and jewelry.
2.    >    > copper and copper alloys
3.    »    » lead, zinc, tin and their alloys.
4.    >    > smithcraft and in sheet iron.
5. Cast iron and steel.
6. Artillery arms, guns and implements.
7. Side arms and cutlery; instruments for working different materials; scythes and sickles.
8. Wire and wire manufactures.
9. Locks and the different productions of the locksmith.

It is quite impossible to define the dimensions and cost of the productions in metal manufactured in Russia as the statistical informations on the domestic and manufacturing industries are not yet ready, although the Government has paid special attention to this question. As to the data which the Ministry of Finance has given on the manufacturing and large trade industries, to which belong such establishments as contain more than sixteen workmen, it must be admitted that they are also incomplete owing to the manner in which these statistics have been gathered. Besides, some manufactories and fabrics which belong to one owner and not incorporated, and therefore not obliged to publish their reports, as well as some trade establishments, generally return their data too low, from fear that additional taxes may be imposed upon them. Therefore, the official figures published in the different parts of this survey of the cost of the different productions must be considered in general lower than the fact. In the same way the definition of the cost of some domestic industries must also be considered only approximate, as the data were based upon material in hand, more or less imperfect.

#### PRODUCTS OF THE NOBLE METALS AND JEWELRY.

The working of articles in gold and silver in Russia dates from very ancient times. The industry was more or less prominent in pagan times but became especially developed since the introduction of christianity, when gold and silver wares

attained a definite style in designs and in the character of workmanship. The improvement in gold and silver wares began with the Byzantine artists who came to Russia and left very decided traces of their influence on the character of the Russian designs, which are still very similar to the pure Byzantine types. Although the German artists, who later on came to Moscow, made great changes in these designs, still the fundamental character of the Byzantine style has not lost its predominating influence. The Byzantine has been reproduced in a whole mass of articles made during the last fifty years by the best Russian silversmiths.

The working of jewels came to Russia much later, namely, in the sixteenth century. It began in Moscow, which owing to its being the residence of the Court and grandees, was the principal centre of silver, gold and jewel works. Thus, in the beginning of the eighteenth century, according to some documents which have survived, there were in Moscow 43 goldsmiths and 232 silversmiths, amongst them were jewelers.

Only in the middle of the eighteenth century gold and silver fabrics were organized in Russia; these fabrics had a certain constant number of workmen in them and articles in gold and silver were prepared not only to order, but as other market merchandise. Well organized workshops with a considerable number of workmen were established at the end of the last century and the beginning of the present. The principal of these founders is Sazikov who built his factory first in Moscow and later on in St. Petersburg.

Owing to the choice of good models, to the careful execution of the designs of good artists belonging to the fabric and by others, and to the excellent finish of the work, Sazikov became celebrated not only in Russia but also abroad. The *repoussé* works done by him always attracted the attention of experts and amateurs by the force of their relief. Mechanical apparatus and steam motors were first introduced in the Sazikov's factory at St. Petersburg, where latterly 75 workmen were working and producing articles to the value of 150,000 roubles. Unfortunately this exemplary silver fabric had to be closed in 1880, after the death of the director. However the workmen who had long served there were very useful from their knowledge and experience to other fabrics; some of them even opened their own workshops and took orders from silver stores.

The enamelling of silver was very little known until about 1850, and the work previous to that time was imperfectly executed. This art began to be developed owing to the Moscow manufacturer Ovchinnikov who founded his establishment in 1845. Later on he opened at his works a school with practical classes of drawing and of the science of silver art. He produces articles for the sum of 300,000 roubles yearly, works 120 men and is now the first silversmith in Russia. Next come Khlebnikov and Postnikov, both also great manufacturers of fine enamelled silver goods, with their own factories in Moscow.

The jewelry industry is principally centred in St. Petersburg and Moscow, where it has numerous representatives who possess well organized factories. Some of them use mechanical apparatus, especially stamping machines, for the manufacture of more ordinary articles.

Silver and jewelry industries bear also in some localities a domestic character which was especially developed and attained great proportions about the thirties, in

the government of Kostroma, along the borders of the Volga in the village Krasnov, which is the centre of the trade, and partly in the village Sidorovskoe and in 50 others which adjoin it. The peasants of some of these villages do not at all occupy themselves with agriculture and consecrate their whole time to the silver and jewelry industry. The articles manufactured by these peasants are sold over all Russia, not excepting the capitals, by middlemen who get them very cheap from the peasants and sell them at great profits on the markets. A great many of these articles go to the Balkan countries, as also to Persia and Central Asia.

The productions of the Kostroma peasants amount to the sum of 700,000 roubles yearly. They consist not only of silver articles but also of those in copper and latten which are sometimes gilt and sometimes only covered with a hard varnish; all these are made by the same smiths and are therefore included in the same category. An enormous quantity of articles is made for the above-mentioned sum, if it be taken into consideration that silver earrings with small turquoises are sold for 40 kopecks per pair and with artificial stones and strass, 23 kopecks, silver brooches, 75 kopecks to 3 roubles per piece, and latten rings, 7 kopecks each. In general articles in silver are prized for sale at 33 to 35 kopecks per zolotnik.

The price of latten articles is still more astonishing; thus for example, crosses, a thousand pieces of which weigh two pounds, are sold at 40 to 50 kopecks per pound. rings weighing three-quarters of a pound per thousand are sold at one rouble per thousand, and if they are gilt, at 10 roubles per thousand; earrings with beads or stones, 15 roubles per hundred, and simple earrings at 2.50 roubles and so on.

Investigations show that in the above region more than 15,000,000 pieces of different articles from silver and latten are made yearly. These consist of earrings, rings, brooches, bracelets, locket, chains and neck crosses, the greatest number of which form silver, latten and copper rings. In both regions, Krasnoselsk and Sidorovsk. more than 3,000 men work at these articles. This work is considered very profitable although the pay to workmen is very low; thus for example, for the making of a hundred rings, the workmen receives 2.70 roubles and for the same number of brooches, locket and pairs of earrings, 6 roubles. It must be taken into consideration, however, that crosses, earrings, brooches and locket are made with the aid of hand stamps.

It should be noticed that all copper articles the workman must return to the merchant, who orders them by number, and silver wares exclusively by weight, together with the waste and filings. If there is some material wanting, the cost of it is deducted from the earnings of the workman, who receives for making simple articles 6 kopecks per zolotnik.

The agents and the merchants who are in constant relation with the wholesalers of large towns watch for the appearance of new patterns and such as they think the peasant workman can reproduce, they send him, ordering him to reproduce them. Thus, the articles made by these workmen become more and more various.

The many coloured glasses which often decorate rings, earrings and other articles are produced and cut in the same villages; for that purpose white or coloured crystal is used. Such glasses or stones when quite finished are sold at 1.50 to 5 roubles per thousand. Lately, these stones are being principally imported.

Besides the government of Kostroma, articles in silver and in copper silvered

are produced by the peasants in the government of Kazan in the village Rybnoi where rings, bracelets and other ornaments worn principally by the Tartars are made. The peasants work silver also in the governments of Vladimir and Moscow, and in the villages of the latter government the industry is valued at 200,000 roubles.

To the silver industry belong also the black enamel works. This business has been principally practised since ancient times, in Veliki-Oustioug, government of Vologda, where it came according to tradition from Novgorod, during the reign of Ivan the Terrible. Its special characteristics consist in the pretty shades and the durability of the black enamel which differs much from that of Moscow. Now the industry has nearly ceased in Veliki-Oustioug, but is very much developed in Moscow and especially in the Caucasus.

The making of leaf gold and leaf silver belong also to this category of industries. They are made in workshops and by peasants who get the silver and gold in thin ribbons, 14 inches long and 2 inches wide. Such a ribbon which weighs about 7 zolotniks is first cut into small square pieces, which under the hammer are gradually divided into many leaves, the number of which amounts finally to as high as 2,000, each leaf being of 12 inches square; they are put into a book of tissue paper, from 60 to 120 leaves in each. The production of leaf silver and of leaf gold is especially developed in the governments of Moscow and Kaluga, to the value of 500,000 roubles yearly. As in Russia gold of the best quality, namely of 94 standard, is used for making leaf gold; the quality of the latter in Russia is much higher than that of other countries.

The same may be said of the Russian gold and silver thread which by its quality also exceeds the foreign make. The first fabric for such thread was founded in Moscow, about 1770 and its manufacture by hand dates from the introduction of christianity into Russia. Much of this thread is exported to Persia and India. The high qualities of the Russian gold and silver thread and tissues are well known; the Russian gold tissue cloth called *parcha* has no rival of its sort in the world.

The most extensive fabric for making thread and tissues in gold and silver are in Moscow, one of which, belonging to the firm Vladimir Alexeev, has a yearly turnover of 1,000,000 roubles. All the work is done by machines, even the stamping of the so-called sparkles. The household thread making industry is centred in the governments of Moscow and Tver and amounts to the sum of 600,000 roubles per annum. The production of gold and silver in leaves, threads and tissues, including the domestic industry as well, amounts to 3,000,000 roubles yearly.

In conclusion it should be observed that the making of articles from platinum has been introduced into Russia only in recent years and that not in large dimensions, as the demand for objects in that metal is very limited. The principal fabrics for producing articles in platina are those of Kolbe and Lindfors and the chemical works of Tentelev, both of which are in St. Petersburg. They produce apparatus for the condensation of phosphoric acid, evaporating cups, melting pots, plates and wires, and of the latter there is a considerable export.

The production of articles in gold and silver, as also of jewelry especially increased in the years of 1880, and since then it has remained nearly constant. In 1889 there were 52 factories containing 15 steam machines with a total of 250 horse

power, and 2,500 men were employed therein with a total production to the value of 2,800,000 roubles. But taking into consideration that the working of gold and especially of silver is practised in the capitals by separate workmen or by groups of artisans, and that the household industries show also considerable proportions, the total yearly production of jewelry and precious stones amounts to not less than 7,000,000 roubles.

The import of such articles is not great nor necessary, but is due chiefly to the desire of fashionable people to have articles of a certain style, and of foreign make. However, lately great quantities of light and therefore cheap articles in gold are being imported, principally from Germany. The export compared to the import is in every case rather considerable; the principal objects exported are those in silver, as also galloons.

The following table shows the amount of the export and import from 1886 to 1892 of precious metals and jewelry, valued in roubles.

| YEARS.        | GOLD AND JEWELRY.        |         | SILVER PRODUCTS. |         | LEAF GOLD, GOLD THREADS AND GALLOONS. |         |
|---------------|--------------------------|---------|------------------|---------|---------------------------------------|---------|
|               | In thousands of roubles. |         |                  |         |                                       |         |
|               | Import.                  | Export. | Import.          | Export. | Import.                               | Export. |
| 1886. . . . . | 190                      | 78      | 279              | 111     | 155                                   | 109     |
| 1887. . . . . | 127                      | 124     | 248              | 126     | 77                                    | 70      |
| 1888. . . . . | 285                      | 52      | 376              | 208     | 142                                   | 22      |
| 1889. . . . . | 225                      | 50      | 508              | 216     | 145                                   | 124     |
| 1890. . . . . | 234                      | 51      | 500              | 219     | 193                                   | 118     |
| 1891. . . . . | 418                      | 39      | 389              | 206     | 195                                   | 164     |
| 1892. . . . . | 211                      | 38      | 485              | 159     | 113                                   | 85      |

#### PRODUCTS IN COPPER AND COPPER ALLOYS.

To this category belongs a quantity of different products, such as house utensils, church wares, armory, and finally articles of luxury and of art.

Although copper foundries were established in Russia rather late, namely in the middle of the seventeenth century, which delayed the development of the copper industry, nevertheless some articles in copper were produced from ancient times and acquired a firm foundation. The principal of these were bells, which already in the tenth century were one of the most considerable Russian industries of that time. In the seventeenth century the industry was well established as to its technic, as proved by the production in 1653 in Moscow of the celebrated bell, called the Tsar-Kolokol. It is the largest bell in the whole world, is 18 feet in diameter and 19 feet high; about 11,000 pounds of copper were used in its manufacture. Owing to

the fact that bell making is of very ancient origin and to the great demand for bells, the technical side of the industry has attained great development in Russia, and has reached a state of perfection unequalled by foreign manufacture, especially in the making of large bells, ranging in weight from 500 to 1,000 and more pounds each. The principal foundries are in the governments of Moscow, Novgorod, Penza and Poltava.

Peasants make only small bells and the so-called *bubentchik*, which are principally worn on the Russian harness and are universally used in summer and winter by the peasants on all sorts of vehicles. The principal production of such bells is in Valdai, government of Novgorod, where also large bell foundries are located. All the bells for the Great Isaac Cathedral in St. Petersburg were cast in the foundries of Valdai. There are bell foundries also in the village of Sosnovo, Semenovskoe and Lyskovo, government of Nizhni-Novgorod, and in Popovskaia, government of Riazan. The best bells known for the mellowness of their tones are made in Valdai. In general, bell making is very little developed amongst peasants as a household industry.

Table, clock and electric bells, although produced in some establishments of St. Petersburg, Moscow and Valdai, are generally imported.

The dimensions of the bell industry in Russia have undergone no changes during the last twenty years. In the 29 fabrics established in European Russia, Siberia and the Vistula regions, the total of the production in 1890 amounted to 923,000 roubles; there were 286 workmen occupied in the foundries. Including the household branch of the industry the total sum of its production amounts to 950,000 roubles.

The making of bells from steel, which is highly developed now in western Europe, is not yet introduced into Russia, although trials have been made to produce steel bells for railroad signals. There is no doubt that this branch of the bell industry will also take root in Russia very soon, at any rate for bells of small dimensions, as steel foundries have attained great development in the Empire. However, steel bells will scarcely replace bronze church bells; but at all events steel is a great rival of bronze in bell fabrication.

The production of household utensils of copper has existed in Russia since ancient times and was probably introduced simultaneously with the silver industry, as the methods of manufacturing both of these metals are quite the same. Amongst the different household utensils made of copper and latten, the first place is occupied by the *samovar* (tea urn), principally made in Tula and its neighbouring villages lying within a circle of about forty versts from the town.

The samovar industry began in Tula at the end of the first half of the past century, has been gradually developing since then and is now very considerably extended. Although in Tula itself there are several large fabrics, the bulk of samovars are made in villages by the kustars, and in small workshops. A distinctly organized distribution of labour in the manufacturing of samovars exists among the kustars; they generally do not work on their own account, but receive orders from manufacturers or from more or less responsible workshops, where they also receive the requisite raw material. In the manufacture of samovars only the lower part the so-called *poddon*, or stand, as well as the faucet and handles are moulded, all the remaining parts, namely, the body of the samovar, the neck that joins it to the stand.

the interior pipe and the *conforka* are welded out of sheet latten, and the requisite form is given to them by means of hammers. The lids are mostly made at manufactories where they are stamped under presses. Only in recent years, namely in the beginning of the eighties, one of the local workmen invented a new method of manufacturing the lid direct from the sheet by means of pressing it into a form attached to the rotating spindle of a lathe, and by using a special instrument called *davilnik*; due to this new method it became possible for the *kustar* to manufacture all the parts of the samovar.

The total number of workmen engaged in the samovar industry in the above-mentioned region amounts to several thousands, and the value of the production, because of the costliness of copper, attains to not less than 3,000,000 roubles. The Sergievsk volost alone, near Tula, makes about 40,000 samovar bodies for the Tula manufacturers. Finished samovars are packed by the dozen, which according to a universal custom are of different sizes as follows: two samovars of 13 vershoks, (top measurement) two of 16, two of 17, three of 14 and three of 15 vershocks.

The samovar industry, as a domestic trade, exists also in the government of Perm, in the district of the Syksunsk works which belong to the Crown. Here the quantity of samovars produced yearly amounts to the sum of 85,000 roubles, besides other copper utensils, the value of which ranges from 20,000 to 25,000 roubles. This household industry was organized here by the workmen from Tula, who at the end of the past century came to work at the copper workshop established near the copper foundry in the government of Perm. Later on as the copper veins were exhausted this foundry was converted into iron works. Samovars are also made in one of the largest fabrics in the town of Kirzhach, government of Vladimir, although its principal production is of small brass mortars. In some parts of the governments of Kostroma and Yaroslav samovars are also made, although in small quantities.

The manufacture of copper utensils exists besides fabrics and domestic establishments in all the towns in small workshops. Several years ago the making of copper pans was moreover introduced in the metallic works belonging to a Joint Stock Company in St. Petersburg. Basins, trays and other similar articles in copper are produced in many foundries of which the largest are in the government of Vladimir. These last articles are also made in large numbers, by peasants especially in the Moscow government, where the domestic industry alone is valued at 750,000 roubles. The total yearly production of copper utensils in Russia is valued at about 7,000,000 roubles.

Products in bronze, latten and other copper-zinc alloys, which belong to articles of art, are fabricated in Russia in very small quantities. However, this industry is gradually developing, especially in large towns, where it is centralized in small establishments and shops which very often work for large houses.

Owing to the former Russian customhouse tariff the import of artistic bronze was made very easy and that delayed much the organization of bronze works in Russia. Moreover, the rich classes of society during their frequent visits abroad purchased all sorts of bronze articles and ornaments, as many as they needed, in foreign countries, principally in France, which during the last and the beginning of the present century was the only supplier of bronze for the whole of Europe.

The late Duke Maximilian Leuchtenberg established the artistic bronze industry

in Russia upon a firm foundation. He built a large bronze fabric in St. Petersburg, supplied it with good workmen and rich technical means, owing to which the industry was placed from the very beginning on a strong footing. The Duke himself was the principal workman at his fabric, consecrating his whole free time to the industry. Besides artistic bronze this factory produced galvano plastic articles and had a special section for the production of different objects in plated silver. Many pieces of this bronze, executed by this factory, which after the death of the Duke Leuchtenberg passed into the hands of Henke, Pleske and Moran, decorate the Cathedrals of St. Isaac in St. Petersburg and of The Saviour in Moscow, and many palaces and houses of rich people. This factory went out of existence many years ago although one of the Duke Leuchtenberg's successors, Moran, has until now a small bronze foundry.

The Guerin bronze factory exerted a great influence on the development of the industry in Russia, especially when in 1840 it passed into the hands of Chopin; it was founded in the beginning of the present century. Owing to the talent of a Russian sculptor Lanseré, the foundry of Chopin executed a whole series, about 130 numbers, of excellent groups which are celebrated over all Europe and America. After the death of Chopin, which happened in Paris in 1892, his heirs sold all of the Lanseré models to Stange, a manufacturer in St. Petersburg. This last fabric is also well known for its bronze productions of high quality, which are principally articles of furniture, such as lamps, lustres and others. A similar fabric was also founded in 1868 in Moscow, by Postnikov, but principally for the fabrication of church articles. It had a great influence on the development of artistic finish of the works of the bronze industry, by introducing beautiful designs in enamel.

The manufacture of lamps and their appendages is especially developed in Warsaw where the trade, according to official data, is valued at 500,000 roubles.

The factory of the Duke of Leuchtenberg and of his successors, as also that of Chopin, were the real originators of the artistic bronze industry in Russia, and produced whole generations of bronze workmen, who have transferred their knowledge, skill and experience to many small works, and some of whom have opened their own small workshops.

During late years a considerable number of such factories for producing small articles from leaf bronze, or rather latten, have been started. These articles, of very satisfactory quality and design, are very cheap and are, therefore, bought in large quantities, even by the poorer classes. The schools of practical drawing have doubtless had a great influence on the development of the industry; the import of such goods has in consequence rapidly decreased of late years. It is to be hoped that soon the production of small stamped latten decorations, used for albums and the like, will be introduced into Russia.

St. Petersburg and Moscow are the principal points for the bronze industry, which is very little practised by the peasants. It is very probable, however, that with the increased demands for cheap bronze articles the trade will begin to develop in the villages, especially in those where small pieces in brass are already produced, and which are made in large quantities in the village Lyskovo, government of Nizhni-Novgorod. Shirt studs, buttons, thimbles and other like articles, are yearly produced here to the value of 100,000 roubles, owing to the proximity of the



Nizhni-Novgorod fair, where they are principally bought by the Persians, Bokharians and Armenians. The production of such goods as artistic bronze, lustres, candelabras, lamps, candlesticks, objects for cabinet tables, and the like, amounts yearly to about 2,000,000 roubles.

One of the most extensive uses of copper alloys, is the manufacture of shells for metallic cartridges. This industry is principally centralized in Crown fabrics, although there are two private factories, of which one, in Tula, works for the Ministry of War. The metallic shells for cartridges are made by machinery and the technical part of the industry is on a very high grade of development. At the beginning, the leaf brass required for the fabrication of such shells was principally imported from the United States. This brass was of very high quality, owing principally to the purity of the copper produced from the mines of the Lake Superior region and also to the relative purity of the zinc. But later on, the cartridge works began to use Russian brass which was produced by three foundries, two of which were in St. Petersburg, one belonging to a Franco-Russian Company and the other to Chikin, and the third, in the government of Vladimir, belonging to Kolchougin. Outside of the above mentioned founderies, cartridge shells are produced in very small quantities in the Empire.

Since the manufacture of cartridge shells was introduced in the Crown foundry at St. Petersburg a new section had to be organized there, namely an instrument branch. This section was designed to prepare instruments for most precise measurements, as also implements, such as stamps and matrix moulds for making tubes and cartridge shells. To what a degree of exactitude this industry has attained may be seen in considering the delicate requirements of cartridge making. It is no longer difficult to limit the dimensions of the different parts of the cartridge to 0.001 of an inch, and of instruments to 0.0001 of an inch. The contingent of learned smiths has facilitated the progress of this work, and many other manufactures, especially the making of mathematical, physical and telegraphic instruments which, as is known, require very great exactitude.

Brass tubes, cloth-printing cylinders, locomotive furnaces and other heavy articles of machinery are manufactured by many firms, the chief of which is the Brass-rolling Mill and Tube-making Manufactory, in St. Petersburg, formerly owned by Rosenkranz. The general production of this manufactory, the rolling of sheets included, amounts to about two million roubles a year. The manufacture of brass and latten tubes for steam boilers, and of surface refrigerators at the Izhora works at Kolpino, belonging to the Admiralty, forms a prominent branch of the industry, rated at the average value of 100,000 roubles per annum.

Brass fixtures, brought a short time since wholly from abroad, chiefly from Germany, are manufactured at some works specially organized for the purpose, thus furnishing the means to make very cheap articles, and very satisfactory in quality. Many factories have already introduced the moulding of such goods from metallic models by machinery, and have in general established the business on a sound footing as regards technical qualities. The fixtures made at these manufactories, such as stopcocks, valves, oil boxes, steam whistles and the like, are of many types of construction, and show many varieties of each type. This manufacture is chiefly concentrated in St. Petersburg and Moscow, and together with the making of tubes and

other parts of machinery may be estimated at not less than two million roubles per annum.

It has been noticed of late that, like mechanical fixtures, the manufacture of articles required for gas and electric lighting, until recently brought from abroad, has developed greatly. Moreover, with the large manufacture of brass, bronze and latten articles the smaller industries also should be mentioned, for instance, the making of buttons, the yearly output of which amounts to 200,000 roubles, as well as that of harness, carriages, stove fixtures, brass foil and the like. A great part of these manufactures, however, are hand-made, so that it is not possible to have exact information as to their amount and value.

Finally, the articles of white metal and of copper plated with silver should be considered. The latter on account of the great competition of melchior, that is, white metal articles, or German silver, are going more and more out of use, plated silver being preferred except for church use.

The manufacture of melchior in Russia dates from long ago; the principal factories producing such articles, to the value of more than one million roubles, are concentrated in Warsaw, where this branch of trade was first established. Mechanical contrivances are used for this work, stamps and rollers being of first importance. If St. Petersburg, Moscow and some other places be counted, the production of melchior and articles of plated silver may then be estimated at not less than one and a half million roubles yearly. Thus, the general output of bronze and brass articles, the hand-making and trade establishments included, according to the existing data, amounts to about 16 million roubles yearly.

The following table shows the import and export of brass and bronze articles from 1886 to 1892.

| Y E A R S.    | Wares of brass and brass alloys.      |         |                                 |         |                        |  |
|---------------|---------------------------------------|---------|---------------------------------|---------|------------------------|--|
|               | SIMPLE WARES.                         |         | WARES WITH ORNAMENTS IN RELIEF. |         | GOLD AND SILVER PLATE. |  |
|               | T h o u s a n d s o f r o u b l e s . |         |                                 |         |                        |  |
|               | Import.                               | Export. | Import.                         | Export. | Import.                | Export.  |
| 1886. . . . . | 2,177                                 | 143     | 78                              | 55      | 69                     | Is included in the preceding column of export. |
| 1887. . . . . | 1,215                                 | 168     | 60                              | 57      | 63                     |  |
| 1888. . . . . | 1,053                                 | 262     | 42                              | 53      | 62                     |  |
| 1889. . . . . | 1,517                                 | 191     | 67                              | 137     | 73                     |  |
| 1890. . . . . | 1,432                                 | 143     | 67                              | 32      | 67                     |  |
| 1891. . . . . | 1,314                                 | 320     | 152                             | 48      | 63                     |  |
| 1892. . . . . | 1,313                                 | 211     | 472                             | 69      | 89                     |  |

## ARTICLES OF ZINC, TIN, LEAD AND THEIR ALLOYS.

The wares of this category are far from having the same importance in the industry of metals as those of brass; a secondary place is allotted to them, however, not only in Russia but abroad. Moreover, it should be mentioned that as tin and lead are worked in insignificant quantities in Russia, foreign materials are exclusively used for the manufacture of such goods. Zinc too, although its casting was long ago begun in the Vistula governments, rich in zinc ores, is imported in rather considerable quantities, which in 1889 began to exceed even the amount of internal product; the latter fluctuated between 220,000 and 280,000 pouds for the last decade and was unable to satisfy the home demand.

The need of zinc, as an integral part of latten and green copper, has evidently increased of late years, as the import of copper in bars has also constantly increased. notwithstanding the growth of copper wares in Russia and the high duty paid thereon. Moreover, the rapidly increasing manufacture of cast zinc articles should be considered. Due to the universal use of kerosene lighting of late years, even in the villages, a large demand for lamps followed, the standards and fixtures of which are mostly cast from zinc.

Furthermore, zinc is now often substituted for green copper in the manufacture of different small household articles. The fashion for zinc figures and various ornaments now in vogue called forth the organization of several establishments in St. Petersburg, Moscow and Riga for the making of such articles.

The use of sheet zinc also increases constantly; it is more and more employed in house building, for example, for cornices, eave troughs, gutters, columns for the balconies, and the like. Lately a new branch of the industry was introduced into Russia, namely, the plating of zinc sheets with nickel; such sheets are used for sponging woollen stuffs, and were formerly always imported. The value of the zinc manufactures amounts approximately to 2,500,000 roubles.

As to the articles made of lead, they are not very diverse; tubes, lead pipe, shot and bullets are the principal; bottle capsules and lead foil come next. Lead in alloy with antimony is used for type; in alloy with tin, for kitchen ware. The annual import of lead for the last few years exceeded 1,000,000 pouds, and in 1892 it was 1,600,000 pouds, the internal lead works in Siberia, in the Caucasus and on the Kirghiz steppes amounting only to 50,000 pouds. Thus, Russia yearly consumes lead to the amount of nearly 4 million roubles, reckoning the metal at 2.50 roubles per pound.

Type is the most costly article produced from lead; its average price is 20 roubles per pound; the price of the other articles, as lead pipe, shot, bullets, bottle capsules and lead foil, does not exceed, on the average, even double the price of the raw metal. Thus, the yearly value of lead manufactures can be fixed at about 6 million roubles.

Tin is rarely used alone. A sufficiently large quantity of it goes to the manufacture of tin plate; moreover it is used as an integral part of bronze, and for tinning, soldering and the like; therefore, the value of tin must be considered as entering into the price of different bronze goods. Articles of britannia, that is, an alloy of tin and antimony, are not made in Russia, and their use is very limited. They

are yearly imported to the sum of 25,000 roubles. Thus, the value of the output of this group of metals can be placed at about 8,500,000 roubles per annum.

The import of zinc and tin goods, the latter forming a very small amount, as well as of lead wares, and various articles used for printing, such as type, matrix moulds, clishé and the like, is in general not large, and its fluctuations are few, as may be seen from the following table.

| YEARS.        | ZINC WARES.           | LEAD WARES. | TYPE. |
|---------------|-----------------------|-------------|-------|
|               | Thousands of roubles. |             |       |
| 1886. . . . . | 352                   | 20          | 99    |
| 1887. . . . . | 192                   | 30          | 160   |
| 1888. . . . . | 181                   | 21          | 123   |
| 1889. . . . . | 229                   | 19          | 125   |
| 1890. . . . . | 246                   | 32          | 159   |
| 1891. . . . . | 255                   | 50          | 114   |
| 1892. . . . . | 182                   | 23          | 143   |

#### BLACKSMITH WARES AND ARTICLES OF SHEET IRON.

The forge belongs to one of the most ancient trades; its establishment corresponds in general to the discovery of iron ores in various localities, while foundries and forging were often done in the same shops. The superfluous iron was sold, and therefore smithies were organized in those places where no ores were to be found, principally on navigable rivers and large trade centres. The number of smithies increased with the development of the iron manufacture; some of them began even to work certain articles as a speciality. Thus, the Ulomsk region, district of Cheriepovets, government of Novgorod, developed the nail trade of various kinds, from boot nails to ship nails, the work being exclusively hand-made. The nails of Ulomsk formerly sold very readily on all markets; other nails were not able to compete with them.

In the above mentioned region at the beginning of the seventies about 600,000 pounds of nails were forged, to the value of nearly 3 million roubles; but later on, with the appearance of machine-made wire tacks and cut nails, the trade rapidly decreased, and at the present time it has lost its former importance, and only large nails, especially ship nails, are now forged.

The manufacture of nails is general also in some of the districts of the governments of Tver, Nizhni-Novgorod, Viatka and Yaroslav. In the government of Tver small nails and tacks are still produced in great quantities, and their output amounts to 400,000 roubles a year, the nails varying in price from 3 to 8 roubles per pound; in the government of Nizhni-Novgorod the nail industry reaches 300,000 roubles, and in the Viatka government, 150,000 roubles.

In the governments of Nizhni-Novgorod and Viatka, chains and anchors are forged to a considerable extent; in the latter government, carriage fixtures are forged.

In the government of Perm, in the region of the Nizhni-Taghilsk manufactory, the making of scoops, shovels, basins, pails, spades, hoes, stoves and the like, is very general, the value amounting to 200,000 roubles per year.

Regardless of the above mentioned specialities, the forge and smithy are the most widely spread of the crafts in the Empire, as is easily understood on considering the absolute necessity for the manufacture and repair of the small implements of husbandry, especially for the making of horseshoes and diverse cars, and repairs of vehicles, and the shaping of household articles. In order to have an idea of the extent of the smithy among hand workers, the Viatka government may be taken as an example, where the wares of the forge not only supply the needs of the local inhabitants, but are sold to a considerable extent beyond the limits of the government. From carefully collected data the production of the hand forge of the Viatka government alone amounts to 1,250,000 yearly. Although in most of the other governments the smith craft is not of so much importance, still it everywhere holds a conspicuous place in the category of other manufactures. The making of horseshoes by hand, for example, is especially developed near the town Kassimov, in the Riazan government; the price of a set of four shoes generally varies from 30 to 50 kopecks.

Hand forging is still practised very generally in the manufacture of most of the above mentioned wares; nails, however, as has been already said, are principally made by machinery, from wire or sheet iron cut into strips, and from bar or plate iron. The production of nails in that case is by the cold process, thereby evidently economizing the iron, as considerable is always lost in burning, and further lessening the cost of manufacture by the more rapid process of making nails from cold iron. Some sorts of horseshoe nails, however, are subjected to the heating process. Moreover, the number of machine-made nails per pound is always greater than when forged by hand.

The factories for making nails by machinery, according to the latest improvements in the industry, are chiefly centred in the large cities, principally in St. Petersburg and Riga, often in conjunction with wire manufactories. At present Finland remains as the chief producer of hand-made nails, its yearly production amounting to 200,000 pounds, the greater part of which are used for ship building.

As for horseshoe nails, the most of them are machine made; it should be stated that the heating process is practised at the great manufactory at Vileika and the cold process at the manufactories of St. Petersburg.

The building of railways and their reparation called forth a new branch of industry, namely, the manufacture of the tie-nails and clamps, and which are made at special factories as well as at the rail-rolling mills. The work is exclusively machine made, and foot hammers of the Oliver system are preferred for forging clamp nails.

The Crown manufactories, Kolpinsk near St. Petersburg, and Votkinsk in the Ural, are justly renowned for the forging of strong chains. The quality of the metal used in this manufacture, as well as the tests of the finished chains are fixed by special regulations, and their solidity and uniform strength are warranted. For the curving and soldering of the links, mechanical processes are used. The Kolpinsk Manufactory, working almost exclusively for the Admiralty, has produced in recent years about 25,000 pounds of chains per annum, the thickness of the links being from a quarter of an inch to two inches and three-quarters, and the average price, about ten roubles per pound.

The hand-making of chains is, as mentioned above, widely spread in the government of Nizhni-Novgorod, namely, in the church village of Besvodnoe and the adjoining villages, as well as in some parts of the Semenovsk and Balakhninsk districts of the same government. The output here of this manufacture is placed at 100,000 roubles; the industry constantly improves, although with no such rapidity as could be expected in view of the great demand for chains for ships, and for sea and river boats.

The absence of regular chain tests for want of proper machines for that purpose compels many of the ship owners to buy chains at higher prices from the Crown manufactories, and even of foreign make.

At the village Besvodnoie, chains are exclusively hand made; for the finest rod iron of a quarter of an inch in diameter is used; the thickest are made of the same iron, but of a diameter of one and three-quarter inches. The price varies according to the diameter, from 3 to 5 roubles per pound, their length averaging from 15 to 20, very rarely 30 sagesnes.

Large anchors are manufactured exclusively at the Crown works, Kolpinsk and Votkinsk, where special machinery for the work is in use, especially heavy steam hammers; each anchor is thoroughly tested as prescribed by law before it is permitted to leave the works. The official data show that the Kolpinsk manufactory produces, for the requirements of the navy, anchors of Martin and Trotman patterns, the heaviest of which is 450 pounds; the price for such anchors varies from 14 to 29 roubles per pound. The prices at the Votkinsk works are considerably lower. Of the private manufactories the Dobriansk, owned by Count Stroganov, makes good anchors of small dimensions for local navigation. Hand-made anchors are chiefly confined to Gorodets and the village Bor, both in the vicinity of Nizhni-Novgorod, but the quality of these anchors is far from being satisfactory, as a poor kind of iron and all sorts of scraps are used in their manufacture. They are made of a weight of 6 to 47 pounds, and their price varies from 2.20 to 3.80 roubles per pound.

The manufacture of spades, hoes and kindred implements is spread in different localities; the best equipped works are, no doubt, the Crown arsenals, where various mechanical contrivances have been introduced, especially for the working of spades. Lately a very well equipped factory has been founded at St. Petersburg by Spiegel, which produces chiefly spades and some other farm implements. Furthermore, the house-building articles, such as stairs, window frames, rafters and the like, are made at mechanical manufactories together with various machinery, or at trade establishments found even in the smallest towns.

By reason of the extreme variety of the blacksmith wares in general, and especially as the household industries are greatly diversified, it is impossible to give, even approximately, the value of their production. However, it can be stated that the general output of the blacksmiths is something more than 20,000,000 roubles annually. Of wares of sheet iron and steel, plate and packing cases must be given the first place. Plate is generally made of black iron, and then tinned or enamelled, or of white iron, the latter being preferred for light wares. Packing cases boxes, cans and the like are exclusively made of tin.

A very large production of black and tinned plate has long since been established at Kassimov, government of Riazan, by the merchant Salaskin; due to the

country fairs, especially to the fair of Nizhni-Novgorod, his wares are widely sold, his very low prices being active factors in furthering the trade. For example, at the Fair of 1890 in Nizhni-Novgorod, the black plate was sold at the price of 2.85 to 3.10 roubles, and tinned plate at 4 to 8.25 roubles per poud, according to the sizes of the articles. The same kind of plate is manufactured by smaller dealers at Kasimov, as well as in some other localities of Russia, especially in the government of Perm. The manufacture of forms for sugar loaves, owing to the constant growth of the sugar industry, holds also a very conspicuous place among other trades.

The manufacture of enamelled iron plate was established only in 1881, and has a sole representative in the factory of The Volcano Co. in Warsaw. This factory, using at present mainly soft cast iron, is fitted out with the newest and most powerful machinery, endowing it with the necessary means for stamping plate of very large proportions, and great depth. The quality of the enamel and the great variety in the forms of the articles produced leave nothing to be desired; however, the prices are rather high, due to the absence of competition. In addition to this new kind of ware, the Volcano Factory continues its former work, namely, the making of tin plate. The general production of this factory amounts to 220,000 roubles per annum.

Of the wares made of sheet iron a conspicuous place is held by trays, bread baskets and like articles, which are almost exclusively hand made, chiefly in the Moscow government, and thence sent over all Russia. These wares are generally sold in a painted and varnished state; the trays are frequently decorated with various designs, chiefly flowers, which are not badly executed for village painters, mostly after their own fancy. The iron wash stands, made in the same localities of the Moscow government, are also related to this kind of trade; owing to their cheapness they compete successfully with the town wares, in the making of which sheet zinc is mainly used. The manufacture of painted wares of sheet iron amounts in the Moscow government alone to 150,000 roubles, and for all Russia. its value must be reckoned at not less than 750,000 roubles yearly.

The production of welded pipes can be regarded as an important branch of industry, seeing that in 1876 a manufactory was founded in St. Petersburg by Shodouar, a Belgian subject; attempts of the kind had been made in the sixties at the Vyksounsk factories of the Shepelev. Recently, in 1890, a second pipe-rolling manufactory was founded by this firm in the Ekaterinoslav government; in 1884 such a factory was established in the small town Sosnovitsi on the western frontier. The production of these three works amounts to over 300,000 pouds yearly, to the value of 1,500,000 roubles. The import of iron pipes, however, notwithstanding the development of the home industry greatly increases, so that in 1887 it amounted to 31,000 pouds, in 1888, to 97,000 pouds, and in 1889, to 101,000 pouds; this increase is easily explained by the great development of the construction of aqueducts in the towns of Russia.

The different kinds of tin cans used for packing, as well as all sorts of tin plate, are almost exclusively home made; they are manufactured in many towns, but especially at Moscow and St. Petersburg, where besides handwork, machinery is used. Tin cans are also manufactured on a large scale in the localities engaged in the preparation of preserves, the latter industry increasing greatly of late. The cele-

brated manufactory at Batoum should be mentioned, which uses one million pounds of foreign tin, imported duty free, for the manufacture of tin cases for the export of kerosene.

Finally, the production of iron barrels for the export of alcohol, and the manufacture of pipes, stoves and other house-heating appliances should be added to the list of products of this section. The goods of the first category are generally made at manufactories; those of the second, in trade establishments, at which hand machines are also frequently used, especially for the manufacture of elbow pipe. Owing to the great variety of the articles produced of sheet iron and tin and the scattered state of the factories, the exact value of the industry cannot easily be given; it may be estimated, however, in round numbers at eight million roubles, excluding the production of the Batoum works.

Lastly, another industry, where the forging process is used, should be mentioned, namely, the manufacture of iron fences and gates, which are often of a very elegant form and decorated with cast iron designs, representing branches, leaves and flowers. The chandeliers and wall brackets, growing more and more into use in rich houses for halls and staircases, come under this category. Many of these articles as to design and finish can be rightly placed among the works of the fine arts. Manufactories producing this kind of wares were established in St. Petersburg, Moscow and Odessa, some 15 to 20 years ago, and notwithstanding this short period of time, have attained a great degree of perfection chiefly due to the schools of practical drawing.

The import of the wares of the blacksmith, including steel, according to the data given by the customhouses, and of wares of sheet iron, black as well as tinned and enamelled, and the exports thereof, are shown in the following table for the years 1886 to 1892.

The amount of the export of these wares is included according to customhouse data in the general total of iron goods. In 1891 and 1892 according to the same statistics the import of steam boilers and iron pipes, which has been rather marked, is included.

| YEARS.        | Blacksmith wares and wares of black iron. | Wares of tin and sheet iron. |         |                                |   |
|---------------|---|------------------------------|---------|--------------------------------|---|
|               |   | SIMPLE AND ENAMELLED.        |         | WITH GOLD PLATE AND ORNAMENTS. |   |
|               | In thousands of roubles.                  |                              |         |                                |   |
|               | Import.                                   | Import.                      | Export. | Import.                        | Export.                                     |
| 1886. . . . . | 1,769                                     | 424                          | 3       | 44                             | Included in the preceding column of export. |
| 1887. . . . . | 1,592                                     | 337                          | 4       | 34                             |   |
| 1888. . . . . | 979                                       | 243                          | 4       | 36                             |   |
| 1889. . . . . | 1,274                                     | 350                          | 12      | 49                             |   |
| 1890. . . . . | 1,127                                     | 411                          | 6       | 59                             |   |
| 1891. . . . . | 1,291                                     | 487                          | 12      | 74                             |   |
| 1892. . . . . | 961                                       | 492                          | 6       | 58                             |   |



## MANUFACTURES OF CAST IRON AND STEEL.

The making of cast iron in Russia dates from the first half of the seventeenth century. In 1637 a Dutchman, named Vinus, established with the sanction of the Tsar Michail Feodorovich the first cast iron foundry, near the village Torokhovo, fifteen versts from Tula. The founding of steel was introduced in Russia only recently.

Two methods of making cast iron are to be distinguished; the first founding, in high furnaces; and the second founding, in cupolas and hot blast furnaces. Most of the cast iron wares in trade are made in the high furnaces, and this method of manufacture has a direct influence upon the cheapness of such goods. In such manner cast iron plate, artel kettles, diverse stove appliances, pipes and other articles are made, requiring no special compactness of the metal nor marked resistance to mechanical force. On the other hand, castings pertaining to different parts of machinery, because of the higher quality of the material and of the precision required, are always cast by the second process, that is, in the hot blast and reverberatory furnaces.

The village workers, *kustars*, generally produce very little cast iron, and that chiefly for implements of husbandry and machines of rural economy; thus, the representatives of this kind of industry are mainly the mining works and mechanical manufactories, as well as special cast iron foundries. The fuel used in founding cast iron in hot blast furnaces is generally wood coal in the Urals, anthracite in the South, and coke in all other localities; some of the Ural manufactories, however, find it profitable to use coke, and even the dearer Donets coal, when founding cast iron in the hot blast furnaces.

The pipes required for aqueducts and gas mains were formerly brought exclusively from abroad, chiefly from England; but since the tariff of 1867 was introduced, the casting of mains began to be established at the Russian works. Now there are already several manufactories scattered in various places of Russia furnishing wares of very satisfactory quality; many of them have lately introduced the machine moulding process. Cast iron enamelled plate is equally made now in varying quantities at the Russian high-furnace manufactories, chiefly established in central Russia, namely, in the government of Kaluga and in the Vistula region, where the first place is allotted to the Petrokov government. During the years 1880 to 1886 the production of this kind of plate, with but few fluctuations, can be fixed at from 57,000 pounds in 1885, to 88,000 pounds in 1886, and from 1887 it has constantly increased as shown below.

| Y E A R S.     | POUNDS. |
|----------------|---------|
| 1887 . . . . . | 158,000 |
| 1888 . . . . . | 205,000 |
| 1889 . . . . . | 254,000 |
| 1890 . . . . . | 289,000 |

In recent years the price of cast iron enamelled plate at the Fair of Nizhni-Novgorod was 3.20 roubles per pound; at the manufactories of the Vistula region it sold from 2 to 2.40 roubles per pound. Wares of soft cast iron are also worked at some of the manufactories; however, this trade is not conducted on a large scale.

The casting of articles of the fine arts, the chief representatives of which are, from long ago, the Kyshtym manufactories of the Urals, does not represent any considerable branch of industry. It does not even form any part of the regular production of these works, although, due to the special qualities of the cast iron employed, permitting of the finest finish, the wares of the Kyshtym works, being very cheap, could easily find markets abroad, especially if subjects of Russian life were treated in the designs. The articles produced are generally not of large size, and owing to their pure outlines and evident material are never stamped; they bear a great resemblance to works made of bronze.

In order to give an idea of the relative distribution of the different kinds of cast iron articles (the casting of bombs and shells for the artillery being excluded), among the different mining works and various foundries, as well as to show the market growth of the industry, the following table based upon official data of recent years has been prepared.

| Y E A R S.                             | FOUNDING IN<br>HIGH FURNACE<br>S. | FOUNDING IN HOT BLAST AND<br>REVERBERATORY FURNACES. |                             | T O T A L. |
|--|-----------------------------------|--|-----------------------------|------------|
|  |                                   | Mining works.  | Foundries for<br>cast iron. |            |
| I n t h o u s a n d s o f p o u n d s. |                                   |  |                             |            |
| 1886. . . . .                          | 2,956                             | 3,316  | 1,908                       | 8,180      |
| 1887. . . . .                          | 3,401                             | 3,178  | 1,600                       | 8,179      |
| 1888. . . . .                          | 3,966                             | 3,497  | 2,110                       | 9,573      |
| 1889. . . . .                          | 4,004                             | 5,378  | 1,670                       | 11,052     |
| 1890. . . . .                          | 3,906                             | 4,444  | 906                         | 9,256      |

It should be mentioned that the quantity of the casting in hot blast furnaces, given in the column of foundries for cast iron, does not show the full amount of the yearly production of these foundries, because the castings made for private customers at the mechanical manufactories and those included in the statistics on machinery building, have not been considered here. The general total of this kind of castings should be reckoned at not less than half of that given in the table above.

Thus, making due allowances for the total, and counting the average price of simple cast iron by high furnace as well as by cupolas, at 1.50 roubles per pound, the value of the production as well as the quantity produced and the import and export thereof for the years from 1886 to 1890, may be given as in the following table, which equally shows the import and export for the two succeeding years, the data for the home production having not yet been published. The crude castings are not separated from the elaborated works in the amount of the export column.

| YEARS.        | HOME PRODUCTION.      |                     | IMPORT.             | EXPORT.             |
|---------------|-----------------------|---------------------|---------------------|---------------------|
|               | Thousands of roubles. | Thousands of pouds. | Thousands of pouds. | Thousands of pouds. |
| 1886. . . . . | 13,701                | 9,134               | 248                 | 5                   |
| 1887. . . . . | 13,469                | 8,979               | 179                 | 16                  |
| 1888. . . . . | 15,942                | 10,628              | 160                 | 4                   |
| 1889. . . . . | 17,831                | 11,887              | 124                 | 15                  |
| 1890. . . . . | 14,564                | 9,709               | 138                 | 18                  |
| 1891. . . . . | —                     | —                   | 58                  | 23                  |
| 1892. . . . . | —                     | —                   | 65                  | 18                  |

As to steel casting in the strict sense of the word, the industry increases yearly and is particularly developed in some of the foundries, and attains a very high grade of products; amid the latter, the castings of stems, stern posts, and screw propellers for men of war, should be mentioned. The rolling of steel iron plates of considerable thickness at the Izhora Crown Manufactories in Kolpino, testifies to the great mechanical force of the factory, as well as to the high degree of technical development. Cast steel is worked at the St. Petersburg manufactories and also at the Ural and south Russia factories.

Besides the steel articles made by simple casting, the Russian manufactories are engaged in the production of various goods of cast steel blocks by forging, stamping and rolling. Thus, car and engine wheels for railways, axles, bands, springs, car beds and other articles of furniture for the rolling stock and road beds of railways, are now supplied exclusively by Russian works. The price of these articles, owing to the increasing cheapness of cast iron and to the development of the trade in itself, shows a visible tendency to decline. This refers equally to various parts of machinery, for example, the simple and crank shafts, connecting rods, couplings and kindred appliances. The manufacture of the railway bands alone, which in 1889 amounted to 640,000 pouds, and in 1890, to 668,000 pouds, proves that the production of the various kinds of steel wares in Russia, especially those relating to rolling stock and road beds, has already reached great proportions, warranting the possibility of supplying the railways with articles of home make.

Owing to the absence of any detailed information concerning the kinds and quantity of the wares made at each of the steel founding works, it is impossible to state the exact quantity and value of the articles cast, forged, stamped and rolled from steel. The following data, received direct from the two manufactories at St. Petersburg, the Oboukhovsk and the Poutilovsk, will give, nevertheless, a general idea of the state of the cast steel industry. It must be said, however, that the speciality of the Oboukhovsk manufactory consists in the making of articles for armament, and that the Poutilovsk works produce principally articles for railway and engineering uses, and to some extent for ship building and the making of armor.

For the years 1886 to 1892 the production of these two manufactories, the orders of various kinds of rails and those of the Department of War being excluded, may be expressed by the following figures.

## MANUFACTORIES.

| Y E A R S.     | ОБОУХОВСК.               | ПОУТИЛОВСК. |
|----------------|--------------------------|-------------|
|                | In thousands of roubles. |             |
| 1886 . . . . . | 198                      | 2,183       |
| 1887 . . . . . | 27                       | 2,607       |
| 1888 . . . . . | 132                      | 1,758       |
| 1889 . . . . . | 77                       | 2,424       |
| 1890 . . . . . | 227                      | 1,757       |
| 1891 . . . . . | 18                       | 1,407       |

The Alexandrovsk Steel Manufactory, also at St. Petersburg, ranks between the two factories above mentioned. Its yearly production of steel wares, excluding rails, together with the production of assorted and sheet steel, amounts to about 2,000,000 roubles. Considering the general information received respecting the activity of Russian steel manufactories, the amount of their output can be placed at not less than 6 to 7 million roubles. Unwrought steel, rails, cannon, ammunition, as well as fire and side arms, are not included in this total.

## GUNS, ARTILLERY SUPPLIES, AMMUNITION AND FIREARMS.

The articles of this category representing the means of State defense, exclusive however of hunting guns, are chiefly made at the State manufactories, which occupy such a high position with regard to their technical powers that they can compete with the best works of Europe and America in quality of work.

The long distance guns of considerable length and 12 inch caliber with which the Russian armor-clad ships, constructed in recent years, are provided, also the battery guns and other arms of heavy artillery, as well as steel balls and shells, proof to the strictest trials of firing at armor, testify to the eminent technical virtues of the manufactories and to the unquestionable experience and skill of the managers. The Oboukhovsk Steel Founding and Gun Manufactory, now belonging to the State, always keeps watch over the contemporary technical development of this branch of industry, and promptly introduces all new inventions, the practical results of which have been duly proved. Many processes of a special character are worked out at the manufactory itself; among these the most conspicuous is the process of cooling in mass, introduced already in 1868, which makes it possible to obtain steel of uniform structure, and at the same time, to increase its resisting powers.

At present the technical equipment of the Obonkhovsk Manufactory, as represented by 11 puddling, 27 hot blast and 3 Marten furnaces, and by 240 casting furnaces, 2 converters, 15 steam hammers, the largest being of 50 tons, one hydraulic press yielding 7,000 tons pressure, furnishes it with the means to execute all the orders of the Department of War and Marine, for guns as well as for artillery purposes in general, and to fulfill in the mean time many orders from mechanical works and railways. The yearly production of this manufactory, including that of assorted steel and blocks used for sheet rolling, amounts to 3 million roubles.

According to official data the Obonkhovsk Manufactory produced from 1887 to 1892 the following amounts of the most important goods.

| YEARS.        | GUNS.         | FURNITURE. | GUN CARRIAGES. | MINING. |
|---------------|---------------|------------|----------------|---------|
|               | I n p o u d s |            |                |         |
| 1887. . . . . | 59,858        | —          | 25,482         | —       |
| 1888. . . . . | 61,406        | 4,166      | 12,355         | 1,820   |
| 1889. . . . . | 39,834        | 3,606      | 11,215         | 1,280   |
| 1890. . . . . | 66,126        | 800        | 12,241         | 1,760   |
| 1891. . . . . | 65,607        | 561        | 39,792         | 1,199   |

The product of this manufactory for the same period including not only the above mentioned wares but also all sorts of orders executed for the Departments of War and Marine may be seen from the following figures.

| YEARS.        | THOUSANDS OF ROUBLES. |
|---------------|-----------------------|
| 1887. . . . . | 2,377                 |
| 1888. . . . . | 2,508                 |
| 1889. . . . . | 1,772                 |
| 1890. . . . . | 2,552                 |
| 1891. . . . . | 2,342                 |

The gun manufactory at Perm, founded in 1863, belongs also to the list of well equipped factories in technical respects; it owns a 50-ton steam hammer of high pressure, and all the necessary means for the working of guns, artillery supplies and other articles required by the Department of War. Running 21 steam engines, yield-

ing on the whole 2,400 horse powers, 4 Marten and 10 hot blast furnaces with 60 melting pots each for casting steel, together with 8 cupola and 9 reverberatory furnaces for making cast iron, this manufactory employs on the average 2,500 hands. During the years 1886 to 1891 it produced to order steel guns and war supplies as indicated below.

| Y E A R S .    | Guns.             | SUPPLIES. |
|----------------|-------------------|-----------|
|                | I n p o u n d s . |           |
| 1886 . . . . . | 25,006            | —         |
| 1887 . . . . . | 27,698            | 5,523     |
| 1888 . . . . . | 10,607            | 8,862     |
| 1889 . . . . . | 14,076            | 8,245     |
| 1890 . . . . . | 7,578             | —         |
| 1891 . . . . . | 5,998             | 20,997    |

This manufactory is constantly supplying the State, with cast iron artillery supplies, and until 1888 executed an order for guns of the 11-inch caliber and carriages therefor; moreover, the factory produces steel casting and other goods, among them railway appliances, as well as assorted and sheet steel. The general production of the Perm Manufactory amounted in 1891 to over one million roubles. Steel artillery furniture is made also in private manufactories, chiefly in St. Petersburg at the Poutilovsk, Alexandrovsk and the Franco-Russian Co. The Poutilovsk Manufactory has executed in recent years orders for the Department of War, valued from 500,000 to 700,000 roubles yearly.

As to artillery supplies made of cast iron, they are worked at the Crown foundries as well as at certain private works. The existing data show that from 1886 to 1890 the following quantities of artillery guns of various calibers have been cast at the Crown works by means of cupola and reverberator furnaces.

| Y E A R S .    | Pounds. |
|----------------|---------|
| 1886 . . . . . | 560,272 |
| 1887 . . . . . | 417,170 |
| 1888 . . . . . | 336,422 |
| 1889 . . . . . | 287,790 |
| 1890 . . . . . | 449,161 |

Moreover a considerable quantity of artillery goods are yearly produced in the government of Perm at the Kamensk Crown Manufactory where the casting is done by the high furnace method. Finally, the guns requisite for the army are made at three manufactories, namely, the Sestrorietsk, in the government of St. Petersburg, the Tulska, at Tula, and the Izhevsk, in the government of Viatka. These works are provided in all their sections with the best machines of the newest construction, so that the different parts of the lock are made so accurately as to outlines and dimensions that they can be easily replaced if need be.

The armory in Russia dates from long ago; in the sixteenth century the gunsmiths of Tula were already renowned; they made side arms and guns of the iron provided by the peasants of the locality, who worked it in their *doushnitsi* (a kind of oven) directly from the ores. This kind of gun manufacture existed probably at the same time at Veliky-Oustyug. In 1595, by order of the tsar Feodor Ioannovich, thirty smiths of Tula were settled in a small village which may be regarded as the foundation of the gun industry in Tula, as well as of the corporation of the armorers obliged to work for the Crown and enjoying therefore special franchises and privileges. It would be well to mention that in the second half of the seventeenth century one of these smiths distinguished himself by his capacities, namely, Nikita Demidov Antoufiev, or Antoufeev, the progenitor of the renowned family of the Demidovs, and was chosen by the genius of Peter the Great for the organization of the first high furnace and iron works in Tula. These works were required to supply the army with balls, and the gunsmiths of Tula with the necessary iron. Later on, Demidov transferred his business to the Urals where, due to his energy and knowledge, he rendered great service to the iron works industry.

At first the armorers made guns at home, and only in the years 1705 and 1706 the first armory yard was organized, with sixty furnaces for the welding of the barrels. The boring and finishing of them was still done by the smiths at their homes. These last operations were introduced only in the new stone armory yard built in the year 1718, and supplied with a water propeller; but after a short time this yard was closed at the request of the armorers, who were allowed to execute all the works at their home as before. Although the manufactory or armory yard was reopened afterwards, yet the greater part of the Crown smiths continued, notwithstanding, to work in their own home shops. This course lasted even after the emancipation of the armorers, in the year 1864, from the obligatory relations to the manufactory. Only in the year 1873, when the works were entirely reorganized and supplied with new machinery, the execution of Crown orders at the manufactory was stopped.

At the beginning of this century an essential reform was introduced in the works of the Tula manufactory, namely the stamping of the hammer and of the different pieces of the lock instead of forging them, the latter method proving to be too slow and difficult because of the small dimensions and exactitude of the articles prepared. This reform was introduced about 1817 by a special gunsmith brought from England and resulted not only in the improvement in the quality of the gun and the reduction of prices of labour, but also in the teaching of the smiths a new method of shaping and working iron, the latter directly influencing the development of other branches of metallurgical industry, for example, the manufacture of locks and fixtures.

The gun works in Tula were reorganized in the year 1873 and shortly after received the title of Imperial Manufactory. It is moved by three Jonval turbines of 120 horse power each, and in addition it has two steam engines of 150 and 50 horse power in order to prevent the stoppage of the works in case of high floods. The total quantity of complete machines, ordered mostly from England, amounts to about 900 pieces. This manufactory is justly considered one of the most important and well organized of the European manufactories; all the parts of the gun are manufactured by machinery and the exactitude and finish as well as the adjustments of the several parts are not inferior to those of the best foreign makes. The production of the Tula factory is enormous; at the time of its greatest activity from 1877 to 1881, that is, during five years, these works turned out 685,425 guns, or on the average more than 137,000 guns annually. From 1873 to 1874 the barrels and cases, made exclusively of steel, were furnished to the Tula Manufactory by the Izhevsk steel works, while up to that date these parts were imported from Austria.

The army having received a new equipment the orders were reduced for a time. Therefore, the Tula manufactory as well as others were allowed to make hunting guns and side arms for private customers, as by such privileges the best workmen could be retained. In late years the Tula works alone made such guns to the value of fifty thousand pieces yearly. From 1885 the said factory has also been working revolvers of the military pattern, which had been until then imported. The yearly production of such revolvers amounts to about eight thousand pieces. Finally, in the year 1886 these works began the making of the Hotchkiss cannons for the Admiralty. Now that the arming of the militia will be changed for the guns of the three-line caliber, the manufactory has been reinforced by additional operators and steam propellers in order to considerably increase the annual output.

The Sestrorietsk manufactory was founded by Peter the Great in the year 1721, and in 1724 it began already the making of guns. It has machines as perfect in construction as those of the Tula manufactory, and is moved by 14 water wheels yielding 300 horse power. The output of this factory has amounted in late years to 70,000 guns per annum, and if some of the minor parts could be worked elsewhere the production could be doubled. The Izhevsk factory, which was founded for iron works in 1763, began the making of guns about 1807. This manufactory uses its own steel, cast steel and Marten steel. It has 8 water wheels and 8 turbines, yielding altogether 520 horse power, and 7 steam engines yielding 675 horse power. For working steel it has one Marten furnace and 21 casting furnaces. The number of hands employed is about one thousand. The production of this factory in the years of the greatest demand for guns, as in 1878 for instance, amounted to 168,455 pieces. The Izhevsk and the Sestrorietsk works, as well as the Tulska, are now turning out a large number of guns of the new 3-line caliber, and therefore they are greatly reinforced in their technical departments.

The enlargement in 1872 of the cast steel works at the Izhevsk manufactory rendered a great service to the Russian armory in that it did away with the necessity of importing steel barrels and cases. This manufactory supplies with steel of the best quality not only gun manufactories but also many other technical establishments working for the artillery. It would be desirable to attract the attention of the manufacturer to the fact that this steel would be of great use in the making of me-



tallic goods, especially knives and tools, and therefore means should be employed to propagate it as much as possible.

As to hunting guns, they are mostly made in Tula and its neighbourhood by the former Crown smiths, some of which have regular workshops. These factories, when turning out very ordinary guns, give out the several parts to be made by special smiths and these parts are merely put together at the factory itself. Hunting guns are made by hand in the villages near the Izhevsk manufactory and in the Belomorsk Korelia, government of Archangel, as well as in Tula, the Archangel guns being exclusively bought by the northern governments where, on account of the immense forests, hunting holds a prominent place among the industries of that people. Principally because the quality is not satisfactory the prices of hand made guns are generally very low, varying from 3 to 10 roubles each, sometimes even falling as low as 1.50 roubles; on the other hand certain well made and finely finished guns are sold as high as 200 to 300 roubles each.

There are few private gunmakers in Russia; they are mostly centred in St. Petersburg, Warsaw and other large towns and in the Caucasus. The output of these works is not large, although the quality of the guns is in many instances not inferior to those of renowned foreign firms. The cause of the small production of these hunting guns is due to the fact that they do not yet enjoy the confidence of the general customer, and sportsmen prefer to pay high prices for celebrated makes. It is stated that 500 hands are employed in the region of Tula in the making of hunting guns and pistols to the value of 150,000 roubles; in the government of Viatka the production of the principal workshops amounts to 13,000 roubles and with that of the small makers it even reaches 30,000 roubles. Two such works in Warsaw sell guns to the value of 22,000 roubles yearly.

The production of the village industry of hand made hunting guns and pistols, added to that of the town makers and to that of the Crown manufactories which, as was already mentioned, also make hunting guns, amounts to 400,000 roubles per annum. It is very difficult to state the amount of the import of hunting guns, which are generally very expensive, as compared with the home production, for the reason that the customhouses do not give any definite information upon the subject.

The following table shows the general weight and value of the firearms brought into Russia from abroad and from Finland, mostly for private customers, as well as of the cartridges and different hunting accessories. The data of the customhouse show, for example, that from 1890 to 1893 there were imported through the customhouses of Moscow, Warsaw, St. Petersburg and Reval, for private customers, 19,275 guns and 144,145 revolvers, most of which went to Moscow. As according to the customhouse tariff the duty for the packing cases is the same as for arms themselves, their weight is included in the total. The table shows the export of arms, firearms as well as side arms side by side with the import, the customhouses giving only general information relating thereto.

| Y E A R S.    | I M P O R T.              |               | E X P O R T.       |               |
|---------------|---------------------------|---------------|--------------------|---------------|
|               | Firearms and accessories. | To the value. | All kinds of arms. | To the value. |
|               | Pouds.                    | Roubles.      | Pouds.             | Roubles.      |
| 1885. . . . . | 5,879                     | 578,431       | 226                | 4,145         |
| 1886. . . . . | 6,325                     | 587,713       | 15,692 ***         | 1,369,875     |
| 1887. . . . . | 4,724                     | 624,614       | 28,121             | 1,230,235     |
| 1888. . . . . | 4,063                     | 558,715       | 220                | 72,619        |
| 1889. . . . . | 4,567                     | 582,659       | 1,058              | 474,191       |
| 1890. . . . . | 8,820 *                   | 559,649       | 372                | 173,510       |
| 1891. . . . . | 6,247 **                  | 562,586       | 322                | 144,916       |
| 1892. . . . . | 6,100                     | 562,000       | 900                | 156,000       |

SIDE ARMS AND CUTLERY; IMPLEMENTS FOR WORKING VARIOUS MATERIALS; SCYTHES AND SICKLES.

The articles of this category belong mainly to the household industry; even the factories, particularly those of the cutlers, do not manufacture articles in their entirety, especially the cheaper grades.

The making of side arms and all sorts of cutlery is one of the most ancient industries of Russia. At the Courts of the Princes of old Russia separate blacksmith shops for the production of such arms were established, using imported iron; steel arms, then only used by the *boyars* or noblemen, were wholly brought from abroad, and eastern blades were prized above all others. Even as the manufacture of iron spread in the different localities of Russia the production of side arms increased with that of other wares; after that time Tula and Moscow were conspicuous as the most important points of this industry; already in the sixteenth century there were many good smiths manufacturing even steel blades.

The making of side arms, as exclusively required by the army and rarely needed by private customers, attracted always the attention of the Government which often induced experienced makers to come from abroad in order to develop the industry and perfect the quality of this class of wares. The manufacture of side arms in Russia became firmly established in 1816, when the Kniasé-Michailovsk factory was founded in the Urals at Zlatoust, and foremen were brought from Solingen in Prussia who were especially skilled not only in the manufacture of side arms but

\* Herein are included 4,812 pouds, to the value of 50,000 roubles, imported from Finland.

\*\* Herein as well as in the total of 1892, according to the customhouse data, side arms are included.

\*\*\* The large sums of export for the two adjoining years relate chiefly to firearms imported to Vladivostok.

also in the casting of steel. Steel casting, however, did not reach the desired development while in the hands of foreigners, and only in later years was the industry firmly established by Russian mining engineers. The names of Anossov, who undertook the management of the factory in 1828, and of Oboukhov, who invented a special process for casting steel, will always be remembered in the history of the Zlatoust side arms manufactory, especially with reference to high grade workmanship.

In the beginning of the eighties the forging of swords at this factory was changed to the rolling process; in order to obtain a uniform heating of the blades before hardening, lead baths were used, which lessened the quantity of waste and raised the quality of the instrument. Soon after, Marten steel was used instead of crucible steel, but without any success; then lathes with emery wheels were employed for finishing the blades; moreover the stamping of brass fixtures for side arms and the mechanical work of the wooden stocks were introduced.

The quality of the swords made at Zlatoust is very high even outrivalling, according to the declaration of specialists, the swords of the average quality produced at Solingen. The Zlatoust blades sustain with ease the severest test, namely the strocking on iron, without showing a mark of blemish. Ready made swords and Circassian sabres are valued at 6.50 roubles per piece. At the present time this factory produces, besides swords, table knives and forks with metallic handles in one piece; they are very often ornamented with damascene or engraved designs, which are especially characteristic of the cutlery made at Zlatoust. Moreover, these works produce surgical instruments and joiners tools, as well as files and gun barrels, the latter in only small quantities.

The following table gives an idea of the production of the Zlatoust factory from 1887 to 1891.

| YEARS.         | SWORD BLADES. | KNIVES AND FORKS. | SURGICAL INSTRUMENTS. | FILES.  |
|----------------|---------------|-------------------|-----------------------|---------|
|                | Pieces.       | Dozens.           | Pieces.               | Dozens. |
| 1887 . . . . . | 46,997        | 139               | 1,047                 | 2,620   |
| 1888 . . . . . | 37,179        | 242               | 1,048                 | 2,340   |
| 1889 . . . . . | 34,565        | 275               | —                     | 2,880   |
| 1890 . . . . . | 43,209        | 352               | —                     | 1,960   |
| 1891 . . . . . | 32,707        | 520               | —                     | 2,030   |

The production of the Zlatoust manufactory, however, is not limited to the above mentioned wares; besides cast iron and steel projectiles, given in the preceding section of this review, this factory produced during the year 1891, for example, the following quantity of steel goods:

|                                    |        |         |
|------------------------------------|--------|---------|
| Machinery . . . . .                | 12,200 | pounds. |
| Blacksmith and locksmith wares . . | 7,200  | >       |
| Wares of cast steel . . . . .      | 2,800  | >       |

Herein must be included also 1,700 pounds of finished brass fixtures for side arms.

The household industry of side arms is carried on in the village Pavlovo, government of Nizhni-Novgorod, near Tula, and in many of the localities of the Caucasus and in Turkestan. The largest of the factories, with a production amounting to 30,000 roubles yearly, is situated in St. Petersburg. The importation of side arms according to customhouse data has amounted in recent years from 125 to 205 pounds annually, valued from 15 to 25 thousand roubles; thus upon the average import, namely 165 pounds, the value would be 20,000 roubles. The manufacture of cutlery, that is, the making of all kinds of knives and forks, razors, shears and scissors, is chiefly centred in the Gorbatovsk district of the Nizhni-Novgorod government, and in the Muromsk district of the Vladimir government, where over 80 villages are occupied with the industry.

The origin of this manufacture in the above mentioned region, the centre of which is the village Pavlovo, popularly called *Russian Sheffield*, relates to the second half of the last century, when Count Sheremetev the proprietor of the region, having established iron works, conceived the idea of teaching his peasants to make cutlery, especially fish knives, which were in great demand for the fishing industry on the lower reaches of the Volga. The blacksmith industry had been in existence a long time in the village Pavlovo and in other places of this locality; the peasants were equally acquainted with the locksmith trade, and these facts led Count Sheremetev to believe that the manufacture of cutlery could be firmly established at Pavlovo and in that belief he proved to be correct.

At the present time the neighbourhood of Pavlovo makes all kinds of cutlery, the quality and prices of which are in such variety that they can easily answer to the requirements of all classes, the poor as well as the rich. The high degree of finish of the best knives, especially in the beautiful and durable polish given to the blades, has caused these goods at international expositions to be admired and wondered at, even by English specialists. During the last 15 to 20 years, besides a great variety of wares, a beautiful choice of designs has added to their otherwise fine qualities. Some of the special knives, such as bread knives, cheese knives and butter knives, bear very often handles that are artistically carved and ornamented.

The making of cutlery in Russia, as is also sometimes the case abroad, shows the most characteristic types of household peasant industry with all the peculiarities relating thereto. Thus, even very large factories as has already been mentioned, do not as a rule work all the successive steps in the manufacture, but give out separate parts to special workmen living in villages sometimes at great distances from the factory, some of whom work the blades, others face and shape them, while others again make the handles and still others put the parts together, when the more artistic workmen finish them off. There are villages wholly occupied at some of these special features of the manufacture. The casting of the blades and especially the affixing of the marks are done at the manufactory itself.

The cutlery in Russia is chiefly made by hand. Stamping is sometimes used to give form to the thicker part dividing the blade of the knife or the tines of the fork from the shank or the handle. In the making of pocketknives, the cutting of the small blades is sometimes done by machine; but on the whole, the work is

hand made, although there is a growing tendency to the use of machines instead of the hand processes. For example, one of the new manufactories of the Muromsk district of the Vladimir government has a steam hammer in use for the cutting out of blades and other pieces, and it is quite a novelty in the manufacture of Russian cutlery.

The number of steam motors for turning the grindstones and whetstones, and of polishing wheels has greatly increased of late. In different localities special factories for polishing the wares were established and furnished with steam, and the use of power lathes and wheels is given to workmen for a fixed sum per day. The number of the larger factories and establishments working cutlery is not very great in the region of Pavlovo.

Knives of the best quality are made of cast steel generally imported from Germany and Austria; those of the average quality are made of iron, with an outer plating of steel welded thereto; however, serious efforts are made to use pure steel, made at the Ural factories. Cheap wares are, however, till now made of pure iron or scrap steel, and broken railway springs are eagerly bought by the cutlers for that purpose. Owing to the scarcity of Russian steel especially suitable to this work, as well as to the lack of variety in the sizes of bar iron, workmen experience great difficulties in their trade thus tending to increase the price of the wares.

The following summary of the prices of cutlery of the cheaper grades will give an idea of the very low rates at which the goods are bought by the local dealers from the workmen.

|  |           |              |
|--|-----------|--------------|
| Table knives and forks . . . . .           | per dozen | 0.50 roubles |
| Knives with welded steel plating . . . . . | » »       | 1.25 »       |
| Pocketknives . . . . .                     | » »       | 1.50 »       |
| Razors . . . . .                           | » »       | 4.00 »       |
| Tailor shears . . . . .                    | » »       | 1.80 »       |
| Common shears and scissors . . . . .       | » »       | 2.00 »       |
| Barber shears . . . . .                    | » »       | 4.00 »       |
| Paper scissors . . . . .                   | » »       | 4.50 »       |
| Bread and kitchen knives . . . . .         | per ten   | 0.60 »       |

The most ordinary knives, having a very satisfactory quality, made chiefly at the local manufactories, are sold at 2.25, 2.50 and 3 roubles per dozen. Table knives made of cast steel, with handles of white bone, are sold at 5.50 roubles per dozen; the same knives with handles of black wood, at 7.50 roubles per dozen. If stag horn or ivory be used for the handles the prices rise to 18 and 20 roubles, and more if the handles be ornamented. The manufacture of cutlery is divided between different points as follows: the village Pavlovo chiefly produces table knives, razors and to some extent scissors; the village Vorsma, pocketknives; the village Vachi, bread knives and trade knives, as well as the commonest sort of table knives; and the village Tumbotino, shears and scissors.

The total of the production of cutlery solely at the factories and establishments of the Pavlovo region, taken from the data furnished by the proprietors, can be fixed at 750,000 roubles per year. If the household industry and that of the small workmen scattered about the locality in a radius of several versts, their wares being sold to dealers on the weekly markets, be reckoned, the total production must be valued from 1,500,000 to 2,000,000 roubles yearly. Besides the region of Pavlovo a great deal of cutlery is made, as mentioned before, at the Zlatoust factory for side arms, but the wares, being of a very high order, are somewhat dear.

The household industry of cutlery in the other parts of Russia is of little trade importance; it is rather more developed in the Shadrinsk district of the Perm government, where a great quantity of common black and white scissors are made, the black scissors having only the blades polished. The black scissors are sold on the spot from 9 to 10 roubles per hundred; the white, at two and three times as much. Sheep shears are made at the Shouisk district of the Vladimir government and at some other places, but their number does not in the least satisfy the demands of Russia for this kind of shears.

Various kinds of cutlery, chiefly of the common sort, are made in the government of Yaroslav, Tula, Voronezh, Kursk, Novgorod and some of the others, as well as in Siberia, in the Tumen region of the Tobolsk government. But in all of these places the production is very limited and in no way compares with that of the region of Pavlovo.

In all large cities, especially in the capitals, there are establishments making principally kitchen and trade cutlery for butchers, fish dealers and bakers, as also certain compound knives, the handles of which contain other articles besides blades, as cork screws, bodkins, hooks and other useful instruments. Warsaw being rather far from the centre of the cutlery industry and seeing that no household industry of the kind is developed, neither in the surrounding country nor in the whole of the northwestern region, has established several factories the amount of their production being about 75,000 roubles per year. The same can be said also of Riga. In these works, which are organized as regular lock manufactories, the wares are all finished up within the walls of the establishments.

Surgical instruments are generally not accredited to the household industry. Articles of this kind are mainly made in town factories. The orders of the Departments of War and Marine are satisfactorily filled by the Imperial Instrument Manufactory at St. Petersburg, and to some extent by that at Zlatoust. In the region of Pavlovo only one factory, that of Varypaiev, produces surgical instruments.

The Imperial Instrument Manufactory makes various knives and other surgical instruments, to the sum of 30,000 roubles; the private establishments in St. Petersburg, to the sum of 20,000 roubles; those of Moscow, to the sum of 30,000 roubles; those of Warsaw, to 25,000 roubles; and those of Riga, to 15,000 roubles per annum. The average annual value of this branch of industry can be estimated at about 200,000 roubles. Thus, the total production of various kinds of cutlery, surgical instruments included, may be reckoned from 2,500,000 to 2,750,000 roubles per annum.

The import of cutlery from 1886 to 1892 is shown in the following table.

| YE A R S.      | WITH ORDINARY HANDLES. |         | WITH EXPENSIVE HANDLES. |        |
|----------------|------------------------|---------|-------------------------|--------|
|                | Quantity in<br>pouids. | Value.  | Quantity in<br>pouids.  | Value. |
| 1886 . . . . . | 2,433                  | 145,934 | 129                     | 23,753 |
| 1887 . . . . . | 2,607                  | 101,202 | 151                     | 23,228 |
| 1888 . . . . . | 1,956                  | 103,775 | 92                      | 17,141 |
| 1889 . . . . . | 2,898                  | 155,402 | 149                     | 25,984 |
| 1890 . . . . . | 2,888                  | 149,406 | 177                     | 36,092 |
| 1891 . . . . . | 3,149                  | 146,333 | 218                     | 18,087 |
| 1892 . . . . . | 2,000                  | 111,000 | 200                     | 22,000 |

On comparing the value of the import with that of the home production, it may be seen that the latter forms only 5 to 7 per cent of the former. But if the imported goods be reckoned per dozen, the result will show that their quantity is very insignificant as compared with that of the yearly home production, the imported knives being very expensive. The same cannot be said regarding the hand instruments and tools of all kinds used at the factories, manufactories and trade establishments, a great quantity of which are imported.

The ordinary joiner and carpenter tools are chiefly made at the cutlery establishment of the Pavlovo region; the orders executed there lately for the Department of Marine, which furnished excellent models, had a very beneficial influence upon the forms and quality of the wares produced. Axes, being implements very generally used, not only at house building where wood is chiefly employed especially in the small towns and villages of Russia, but at all the peasant household works, are made at many localities, the Pavlovo region being again first among them. Besides this place, the making of axes forms from long ago a prominent industry of the town Ostashkov and of the village Mouravievo, near the town Rzhev, both in the government of Tver. The axes made at Mouravievo have always been highly prized even on foreign markets. In Ostashkov a great manufactory, belonging to a merchant named Mossiaghin, produces yearly many tens of thousands of axes and having well established storehouses, is able to extent its trade far beyond the limits of the Tver government. The manufacture of axes is also highly developed in the governments of Vladimir, Tula, Yaroslav, Novgorod, Voronezh, Viatka, as well as in Finland and Siberia, in the region of Tumen, government of Tobolsk. The prices of axes vary according to their dimensions and quality, from 20 to 100 roubles per hundred.

The import of ordinary joiner and carpenter tools is generally small, chiefly lumber saws, the home production of which would be too expensive owing to the fact that instrument sheet steel is very expensive and little made in Russia, augers are also imported in considerable quantities. As to locksmith tools, files being of first importance, their production is placed on a lower footing than the tools of the joiner. Machine shops and lock factories generally buy only the

requisite assorted instrument steel and make chisels and other tools thereof at the works themselves.

The cutting of files, as of implements very much required in the working of metals, is very often done at the metal working establishments themselves, but as the quality of these instruments, especially with regard to the straightness of the body, is far from being satisfactory, even the most distant manufactories, as those of the Urals, for instance, have to bring them from abroad, chiefly from England. The home production of files, as an independent branch of industry, dates only from the fifties, when because of the Crimean war import was very difficult. The peasants of the Pavlovo region were first to introduce this kind of goods, and the industry has continued active there until the present day, developing little by little but not with the rapidity that could be expected, owing to the scarcity and expensiveness of the steel required in the manufacture. However, of late years, the making of instrument steel has greatly increased at some of the Ural works; the Putilovsk manufactory at St. Petersburg has also begun to produce it, and probably other factories will follow; therefore there is every reason to expect that the manufacture of first class files will in due course be firmly established in the Empire.

The Izhora manufactories at Kolpino, belonging to the Admiralty, using since 1888 files made by peasants (koustars), coarse cut as well as fine, of the average length of six to twenty inches, have been able to compare their respective qualities with those of the files made in England. The data given on the manufacture of files at that factory show that this branch of industry cannot as yet be regarded as firmly established, in as much as the files are not always straight nor uniformly tempered, so that there is great loss in the manufacture; however, for the past few years the industry has shown great progress and improvements have also been made in the tempering, shaping and cutting processes. The comparative tests made of the files of two Sheffield firms and of the Russian files of the same length, 18 inches, and of the equally coarse cut, proved that for the filing of cast iron the Russian files were as good as the English, but for the filing of iron they are inferior. The test consisted in weighing the file dust taken from the metal by the same man during three and three-quarter hours. The chemical composition as seen by the analysis made shows no great difference. The price of the Russian files of the length of 10 to 12 inches is lower, and that of files of greater length, higher than that of the English, duty and carriage paid.

Beyond the Pavlovo region the cutting of files has been established in the centres of machine building and of general mechanical industry, as, for example, in St. Petersburg, Moscow, Odessa and some other towns, and also in Tula. Although these establishments are mostly engaged in re-cutting old files, still they generally produce new ones as well.

Reckoning the above mentioned quantity of files made at the Zlatoust manufactory, the general value of the production can be fixed at about 250,000 roubles, including the manufacture of files by the factories and establishments for their own use, as is the case, for instance, at the Kolomensk factory in the Moscow government, and in some others, as well as the re-cutting of old files. This amount is quite insufficient for Russia. The nuts used for cutting the screw is chiefly made by the peasants of the Pavlovo region, but generally in no great variety, nor in great quantities; there-



fore such instruments for manufactory purposes are mostly imported, as well as the vises, which are made in a very insignificant quantity in Russia.

The production of anvils is developed to a considerable extent in Russia; the chief centres of the industry being the Urals, the district of Cherepoviets, government of Novgorod, the Pavlovo region and Finland. Iron dividers with an arc and set screw and steel tips are made at Tula; over 47,000 pieces are yearly produced there, to the value of 6,000 roubles. The price of such instruments depends upon their dimensions (5 different numbers exist) and finish, and varies greatly; thus, ordinary dividers, coarsely filed, are sold from 9 to 16 roubles or an average of 12.50 roubles per hundred, and polished dividers, from 10 to 20 roubles or an average of 15 roubles per hundred. At Tula there are also manufactured about 10,000 pieces of nut crackers annually, to the value of about 2,000 roubles and over 70,000 pieces of sugar nippers, to the value of 40,000 roubles. Other instruments, as measuring tools and all kinds of mathematical instruments, as levels, planes and the like, are chiefly bought abroad, although their quantity is very insignificant as compared to the total amount of implements imported, files being first among them.

The manufacture of scythes and sickles, implements of prime requisite to the farming industry in Russia, holds the same position as that of tools. Although besides the household works of the peasants many factories are engaged in the production of these wares, nevertheless, the general amount of scythes and sickles made does not answer to the needs of the farmer, especially in the years of good crops. The feeble development of the manufacture of scythes and sickles is due to the small protective duty and chiefly to the scarcity and cost of steel; if these obstacles be removed, the production of these wares would attain great dimensions, without counting the production at the works as labour is cheap and the Russian peasant, occupied from ancient times with the manufacture of scythes, in many of the localities has a vast experience.

The Artinsk Crown manufactory in the Zlatoust district of the Urals has long since established the making of scythes, and in the beginning of the eighties the manufacture of sickles was also introduced, although the latter develops at a slow pace. Using its own steel the Artinsk manufactory could have produced scythes and sickles to a much larger amount. The following figures show the output of scythes at the Artinsk factory for the last six years:

| Years.     | Pieces. | Years.     | Pieces. |
|------------|---------|------------|---------|
| 1886 . . . | 22,664  | 1889 . . . | 49,041  |
| 1887 . . . | 19,581  | 1890 . . . | 60,340  |
| 1888 . . . | 40,583  | 1891 . . . | 58,665  |

The scythes of the Artinsk manufactory are sold at 50 kopecks apiece; they are often found to be too heavy. Recently the works began to use Marten steel in their manufacture. Of other factories the one recently established near Vilno should be mentioned. It is owned by Mr. Possel, is well furnished with mechanical contrivances and produces over 150,000 scythes yearly. The manufactory of Mossiaghin at Ostashkov, government of Tver, producing over 30,000 scythes and 20,000 sickles, the two large establishments in the governments of Viatka and Perm, the yearly

production of which is about 18,000 sickles and 35,000 scythes, and finally, Sonnen's manufactory in Riga also claim attention.

The household industry of the manufacturing of scythes is mostly developed in the village Kharitonovo in the Shouisk district of the Vladimir government; its production amounted formerly to 60,000 pieces yearly, but has greatly decreased of late.

The same can be said of the household production of sickles in the Pavlovo region. It should be noticed that besides the manufactory of Mossiaghin a great quantity of scythes and sickles is produced in Ostashkov, government of Tver, at the smithies of the town inhabitants, and that this industry is widely spread among the peasants of many governments, especially in Viatka, Perm and Yaroslav, and in Finland as well.

The scythe made by the peasants has an iron body with a steel edge welded thereto, which in the best implements covers half the width of the blade. The scythes manufactured at Kharitonovo, when from 8 to 11 vershocks in length, are sold at 25 to 35 roubles per hundred, when from 11 to 13 vershocks in length, at 40 to 50 roubles per hundred. From the given data it can be stated that the home production of scythes and sickles in Russia reaches the sum of 250,000 to 300,000 roubles per annum, while the import of these instruments greatly exceeds this sum.

The import of various hand implements, the surgical excluded, as well as that of scythes and sickles for the years 1886 to 1892 is shown in the annexed table. It should be noticed that according to the classification of the Russian tariff in the column of scythes and sickles, sheep shears, spades, rakes, pitchforks and other implements of the kind for field and earth work, are included. Although these articles, sheep shears excluded, are brought from abroad in no considerable quantities, nevertheless the amount of the import given in the table, if referring only to scythes, sickles and sheep shears, should be lessened about 15 per cent for the years when the crop is good, and 20 per cent when it is bad.

| YEARS.        | INSTRUMENTS.         |                                | SCYTHES, SICKLES ETC. |                                |
|---------------|----------------------|--------------------------------|-----------------------|--------------------------------|
|               | Thousands of pounds. | Value in thousands of roubles. | Thousands of pounds.  | Value in thousands of roubles. |
| 1886. . . . . | 176                  | 1,832                          | 213                   | 1,300                          |
| 1887. . . . . | 173                  | 1,881                          | 176                   | 1,219                          |
| 1888. . . . . | 205                  | 2,068                          | 203                   | 1,490                          |
| 1889. . . . . | 267                  | 2,463                          | 272                   | 2,318                          |
| 1890. . . . . | 234                  | 2,209                          | 236                   | 2,018                          |
| 1891. . . . . | 204                  | 1,842                          | 208                   | 1,633                          |
| 1892. . . . . | 214                  | 1,871                          | 225                   | 1,757                          |

The greatest part of the instruments imported comes from Germany; England takes the second place, while scythes and sickles are mostly imported from Austria, chiefly from Styria, England furnishing very few, and in general less scythes than sickles. The export of various instruments, as well as of scythes and sickles, from

Russia is very limited; in the customhouse data it is not given separately, but included in the column of locksmith wares.

On comparing the figures of the table here annexed with those showing the extent of home production of the same wares it will be easily seen that this branch of industry is very little developed as yet. The growing production of steel and the efforts to introduce the manufacturing of special types, including instrument steel, taken at some of the Ural and northern manufactories together with other encouraging measures, gives reasons to expect that a marked improvement, as well as a decided growth of this branch of industry having so great an importance and being so necessary to Russia, will soon be noticeable in the Empire.

### WIRE AND WIRE GOODS.

Although wire drawing is one of the industries founded long ago in Russia, its development relates to the forties, when electric telegraphs were established. The Istinsk manufactory in the Pronsk district of the Riazan government, founded in the year 1719, for iron works was one of the first to introduce the drawing of wire; the household industry of wire drawing had existed already in many localities, the village Besvodnoie situated on the right side of the Volga at 30 versts distance from Nizhni-Novgorod holding a conspicuous place among them; the wire drawn there was used exclusively for the manufacture of fishhooks, the making of which in the village Besvodnoie and in many of the adjoining villages was founded in times immemorial.

The introduction of wire drawing in the Russian iron works was followed by the rolling of thin iron for the purpose. When, in 1863, the right of importing iron duty free given to machine-building manufactories was extended to the wire mills as well, the rolling of thin iron at the iron works did not decrease, and some of them, namely, those situated in central Russia, began to manufacture other kinds than telegraph wire, using imported iron, as it was much cheaper and thinner, a quarter of an inch or 6 mm. in diameter, it being impossible to limit the use of foreign wire when imported free of duty.

The above mentioned franchise, together with the very small expenses of manufacturing such thin iron into telegraph wire (5—4 mm.) brought about the establishment of independent wire mills which used foreign iron exclusively. The markets received a great supply of wire, which began to be used in the manufacture of nails, the production of which grew rapidly towards the seventies and spreading over all Russia excluded even to a certain extent the use of forged nails, the latter forming a prominent branch of industry among the peasants of the village Uloma of the district of Cherepoviets, government of Novgorod, as has been already mentioned. Besides, in the manufacture of nails and tacks, wire was used also in the making of other wares, such as all sorts of chains, latches, clamps and the like.

In 1881 with the cessation of the above mentioned franchise and with the raising of the import tax the following year from 40 kopecks to 1.10 roubles gold per pound for all kinds of rod iron less than half an inch in diameter, the position of some of the wire mills became uncertain. On the contrary the iron manufacturers, at whose

instance such a high duty had been levied, began to set up the machinery necessary for the rolling of fine rod iron for which they had previously laid in a good stock of material, and furthermore, they began to fit out their manufactories with new series of rolling machines, raising in the mean time the price of the small rod iron. This advance was greatly felt by the German manufactories, especially by those of Westphalia, they being almost the sole contributors of that kind of iron to the Russian wire mills and nail factories. Not wishing to lose a good market, some of the most renowned firms organized branch factories in Russia on the western frontier, as well as on the shores of the Baltic, furnishing them with the newest machinery. These new manufactories, owing to their vast technical means, soon began to supply the interior market with great quantities of rod iron at extremely low prices. As a result, the Russian manufacturers in no way profited by the great increase in the duty on imported rod, but only succeeded in calling forth powerful and experienced competitors to their speciality. The latter, besides the rolling of iron, began to manufacture nails and other articles of wire in great quantities.

In order to stop the building of new rolling mills the iron manufacturers sent a petition to the Government, in 1885, asking to reinstate the tariff of 1882, that is, the high duty of 1.10 roubles gold only on rod iron of a quarter of an inch in diameter and under. Their petition was accepted, but owing to the great quantity of wire iron already on the market the prices thereof fell considerably, and have thus remained to this day. The low prices for articles made of wire afforded so little profit to the manufacturers, who were obliged to buy rod iron for their purposes, that many of them have closed their works in consequence. Nevertheless, the large manufactories, founded about 1880 and well fitted out in technical machinery, answered very well to the requirements of the Russian industry for this kind of material, and aided the development of various kinds of wares made of wire, until then produced in very small quantities.

The amount of iron wire and wire nails produced by the manufactories from 1886 to 1890, according to the data collected by the Mining Department, is given in the following table.

| Y E A R S.     | W I R E.      | W I R E N A I L S. |
|----------------|---------------|--------------------|
|                | P o u n d s . |                    |
| 1886 . . . . . | 620,838       | 260,020            |
| 1887 . . . . . | 1,516,400     | 636,035            |
| 1888 . . . . . | 943,197       | 611,279            |
| 1889 . . . . . | 353,985       | 646,153            |
| 1890 . . . . . | 1,390,516     | 1,193,300          |

To the last year's amount not less than 150,000 pounds of wire and over 350,000 pounds of nails, produced from imported iron, should be added. The wire made of steel and cast iron is very little worked in Russia because there is no de-

mand for such materials by the manufacturers who make wire goods. However, in the demand should arise, then the Russian steel works would be doubtless able to furnish it to the wire manufactories, for the general production of steel in Russia, especially of the Marten steel, the best suited for wire drawing, has considerably increased of late years. The comparatively high price of iron and steel in Russia has a great influence upon the market value of wire and wire nails. When foreign wares are compared with the Russian, the difference in the prices diminishes with the increase in the numbers of the wire, the price of labour being much cheaper in Russia than abroad, and the material being of little consideration when very fine wire is ordered.

Brass wire, including wire made of the different alloys of brass, is chiefly made in the regions of Moscow and Nizhni-Novgorod, the Latten and Brass Rolling Mills of Kolchoughin and Co. being the chief representatives of this industry. In the government of Vladimir, where the amount of the yearly production of latten and brass wire is over 30,000 pounds, the wire used for electrical conductors forms a small part thereof. Brass wire, especially of the finest sorts, which are used for the manufacture of wire webbing, is produced in great quantities in the celebrated village Besvodnoie, government of Nizhni-Novgorod, by the local peasants. The general value of the production of brass wire, chiefly of the finest sorts, amounts in this region to many hundred thousand roubles; some observers reckon it at 800,000 roubles, but this figure seems to be rather high.

The wires of special structure, for example, that from phosphureted bronze, are not made in Russia, and therefore must be imported. Some of the manufactories use this ware for wire webbing, and especially for that used at paper mills. The production of the finest sorts of wire is also inconsiderable. These sorts are brought from foreign firms or drawn at the manufactories and establishments using them for weaving. The chemically pure brass wire used for electric conductors, and formerly exclusively brought from France, and in small quantities from Germany, is now made in Russia. Besides the Ural manufactories, in 1887 there was organized a considerable electrolytic factory in the Caucasus, namely, the Kalakentsk, owned by Seemens Brothers, having a dynamo machine yielding 225 horse powers.

The prices for brass wire are generally high in Russia owing to the cost of the metal itself. The production of insulating wire and electric conductors as well as of submarine cables increases gradually, due to the spreading of telegraph and telephone lines and to electric lighting, together with other branches of the electrical industry. The factories and works producing insulating wire are chiefly concentrated in St. Petersburg. The winding of the wire with wool and especially with silk is very frequently done at the galloon factories. The production of different kinds of insulating wire at the establishments of St. Petersburg may be fixed at something over 200,000 roubles per annum.

The manufactories of wire nails, being the chief consumers of Russian wire, are scattered over all the country, as has been already mentioned. The largest firms are, the St. Petersburg Iron Rolling Mill and Wire Manufactory Co., the Moscow Metallic Manufactory Co., (formerly owned by Goujon), Becker and Co. in Libau, the latter having a branch in Koirany, government of Vilno, the Metallic Manufactory of Hantke and Co. in Warsaw, and the Riga Wire Manufactory. These works pro-

duce, on the whole, from 800,000 to 900,000 pounds of wire nails yearly. The steam-boats going from the Baltic to the Black Sea taking a very small freight cargo enable the Baltic factories to send their products even to the Caucasus. The total yearly output of wire nails in Russia amounts now to 5,500,000 and 6,000,000 roubles. The manufacture of cut nails and tacks, bearing great resemblance to that of wire nails, has also greatly developed during recent years; according to existing data its yearly output is over 50,000 pounds, to the value of 200,000 roubles.

Other wares of wire are made also at manufactories and small establishments; they form also a prominent branch of household industry in many localities of Russia among which the first place should be allotted to the village Besvodnoie, government of Nizhni-Novgorod, and its vicinity. In the region of the village Besvodnoie brass wire, as well as iron wire of the smallest sizes, is drawn by means of simple hand appliances, horse power being used only for the making of very thick wire. Chains, fishhooks, hooks and eyes for dresses, wire webbing of different degrees of fineness, and various plaited and woven fabrics used for articles of husbandry and machinery, are also made there.

The largest manufactory for the weaving of wire webbing, owned by Baron Steingel, is situated in Kiev; it uses foreign wire for the finest makes, and the wares produced are justly renowned and widely spread over all Russia. Notwithstanding that the endless webbing for paper mills made by this manufactory was of the requisite breadth, of 4 arshines, and of a high quality and durability, nevertheless, the foreign foremen of the Russian paper mills, probably from habit, continued to use webbing of foreign make. A somewhat large manufactory of wire webbing, and some small establishments of the kind are to be found in Moscow; in St. Petersburg there are only a few small works. The production of all the factories and works of this category, household industry excluded, amounts to 300,000 roubles annually.

Wire cables are made in Riga, St. Petersburg, in the Riazan government at the Istinsk factory and in Kronstadt at the Crown Manufactory; but this kind of manufacture cannot as yet be regarded as firmly established, although wire cables are more and more in demand, especially for mining works. The high prices of the Russian cables, due to the limited production, are retarding the general progress of this branch of manufacture.

Card clothing is manufactured only in Moscow, and by certain comparatively small works and establishments, founded long ago; the amount of their output for recent years is about 150,000 roubles yearly. But Moscow produces only that kind of card clothing used at the wool weaving factories; the cotton weaving manufactories have to bring all such goods as are needed by them from abroad, chiefly from England. The renowned English firm, Horsfall & Co., in 1891, organized a factory for the manufacture of these cards, but owing to the fact that the industry is newly established it is difficult to state whether it will have any influence upon Russian cotton weaving. The same may be said also of the factory of Jacobson recently established in Riga and producing card clothing for wool as well as for cotton.

Wares of wire of the coarser numbers, such as chains for different use, hooks, clamps, braces, handles, helves, clothes pegs, and other articles of the kind, are made by many manufactories in Russia; the first place among them is held by the manufactory Westphalia in Kovno, owned by Smith Brothers, the quantity of the wares

produced being considerable and in many varieties. The output of this factory, including the making of heel irons for boots and shoes, which is one of its marked specialities, and the drawing of wire, amounts to 500,000 roubles.

The region of the village Besvodnoie, already often mentioned for its mechanical works, holds a conspicuous place in the home production of wire wares; its role in regard to this category of articles is equal to that of the village Pavlovo of Nizhni-Novgorod government in respect to the cutlery wares. Certain branches of the industry in the village Besvodnoie, for instance the making of fishhooks, are mainly if not solely represented there, although these wares have a large importance for the vast fishing industry of the Empire. Wire webbing and nets made in this region also find ready markets in the flour mills scattered on the borders of the Volga, as well as on the farms, where they are used for the repair of implements of husbandry; they compete successfully with wares made in Moscow not only in cheapness, but also in quality, some of the manufacturers being very renowned.

The sea fishhooks are made of the wire of the Nos. 0 to 6; the river fishhooks from wire, No. 8 to No. 23; the heavier wire is generally bought direct at the manufactories; thin wire is partly drawn in the village Besvodnoie. The rods are made not in Besvodnoie itself but in adjoining villages. Sea fishhooks are sold by thousands in packets, their price ranging according to their size as follows.

| S I Z E S.         | NUMBERS. | WEIGHT PER<br>THOUSAND.<br>POUNDS. | AVERAGE<br>PRICE PER<br>THOUSAND.<br>ROUBLES. |
|--------------------|----------|------------------------------------|---|
| Largest . . . . .  | 0        | 4.05                               | 21.00   |
| Medium. . . . .    | 4        | 2.00                               | 7.70  |
| Smallest . . . . . | 6        | 1.50                               | 5.60  |

Sea fishhooks are made of 9 sizes, and river fishhooks are of more diverse sizes still; the price of the smallest is about 25 kopecks per thousand, and that of the larger hooks, from 1.50 to 4 roubles per thousand. The yearly production of sea fishhooks, according to official figures, amounts to 600,000 roubles, and that of river fishhooks, to 50,000 roubles. A certain quantity, not very large, of fishhooks is also produced in the government of Viatka at the village Istobensk, district of Orlovsk.

The metallic webbing and nets made in the region of Besvodnoie are of very various kinds, especially the brass webbing, the finest of which contains over 150 threads per vershock. The weaving looms are of very simple construction, their breadth hardly exceeds one arshine, more often less than one arshine. The total production of brass and iron webbing and sieves of various kinds in the region of Besvodnoie is stated at something over 900,000 roubles. It should be mentioned that metallic webbing is also made at the village Stepacheva, district of Klin, government of Moscow.

The manufacture of combs and treddles for weaving looms is also related to that of wire goods; this kind of work is chiefly centred in the governments of Moscow and Vladimir, where, as is generally known, cotton weaving is largely developed. The production of the largest establishments of the kind, situated in Moscow and Ivnovo-Vosnesensk, according to existing data may be fixed at 100,000 roubles per annum.

The total value of the output of wire and wire goods may be placed at about 22,000,000 roubles yearly. The value of import of wire wares for the years 1884 to 1892 is shown in the following table.

| YEARS.        | W I R E.             |   | W I R E W A R E S.    |  | TOTAL.                |
|---------------|----------------------|---|-----------------------|--|-----------------------|
|               | Iron and steel wire. | Brass wire and wire plated with other metals. | Iron and steel wares. | Wares of brass wire and insulating rods. | Thousands of roubles. |
|               | R O U B L E S.       |   |                       |  |                       |
| 1884. . . . . | 542,280              | 614,459                                       | 1,355,006             | 253,113                                  | 2,765                 |
| 1885. . . . . | 367,463              | 450,986                                       | 1,198,999             | 244,874                                  | 2,262                 |
| 1886. . . . . | 197,193              | 267,797                                       | 1,125,252             | 382,101                                  | 1,972                 |
| 1887. . . . . | 190,238              | 130,614                                       | 852,114               | 337,383                                  | 1,560                 |
| 1888. . . . . | 216,550              | 132,515                                       | 1,062,759             | 377,204                                  | 1,789                 |
| 1889. . . . . | 242,019              | 174,826                                       | 1,053,519             | 454,827                                  | 1,925                 |
| 1890. . . . . | 213,100              | 228,251                                       | 980,797               | 496,389                                  | 1,919                 |
| 1891. . . . . | 227,124              | 249,818                                       | 917,178               | 567,495                                  | 1,962                 |
| 1892. . . . . | 235,000              | 383,000                                       | 965,000               | 876,000                                  | 1,959                 |

From the above figures it may be seen that, although the demands for wire and wire goods has constantly increased, the general total of the import has decreased since 1880, especially that of iron and steel wares: therefore, the requirements of Russia for the goods of this category are largely supplied by the home production the value of which is ten times that of the imported wares. If the import be compared with the home production with regard to the quantity or weight the result will be still more favourable to the home manufacture. However, the import of brass wire and goods has constantly increased of late, as can be explained by the defects of the tariff covering this kind of goods; in 1891 the tariff was changed and its beneficial results will soon be seen.

The manufacture of pins, needles and screws may also be considered as related to wire goods. The making of pins in Russia never formed a prominent branch of trade; even as a household industry it has never been widely spread, but was chiefly centred in the trade establishments of the larger towns. The production of pins and hairpins was formerly rather considerable in Moscow and in some of the villages of the Moscow government in the district of Serponkhov and Podolsk, so that the impor



was, comparatively speaking, not large; but at the present time the making of these articles, especially of pins, has greatly decreased, the foreign manufactories working them on such a large scale, due to very fine machinery, that they are sold so low that Russian manufactories cannot compete in this branch of the industry, especially as brass wire is much dearer in Russia than abroad.

The cost of brass together with the lowering of the prices for pins induced the kustars, as well as some of the town makers, to use all kinds of scrap brass and rubbish in the manufacture; the wire made of such poor material is of very unsatisfactory quality, and in drawing it very frequent tempering is necessary. Therefore, the pins made of such wire are very easily bent, while those of foreign make, where very hard wire drawn without tempering is used, are generally very strong and not flexible. For this reason foreign pins, even if dearer, are still preferred to those of the home make.

The manufacture of needles has been established in Russia a long while, and may be regarded as a regular industry. However, there are some defects in the hardening process, and especially in the boring of the eyes, that should be remedied; if no improvements be made in this respect Russian needles will always be second to the German make, not to mention the English needles, which as yet have no competitors. Moreover, Russia has no steel wire suitable for the manufacture of needles and is obliged to import all such materials.

The largest and the best equipped needle manufactory, owned by Count Plater, is situated in the Dvinsk district of the government of Vitebsk; according to official data its yearly output amounts to 180,000 roubles. The second place is held by the Kolensk manufactory in the Pronsk district of the Riazan government; its yearly production is valued at 90,000 roubles; it is one of the most ancient manufactories of the kind in the Empire; until 1860 it had even been the only one in Russia. If the production of two more manufactories, the one at Goldingen and that at Dvinsk (Dünaburg) amounting to 100,000 roubles be added, then the general output of the needle manufactories may be fixed at 370,000 roubles, not counting the household industry, which is chiefly developed in the Semenovsk and Balakhninsk districts of the Nizhni-Novgorod government, and to some extent in the Serpoukhovsk and Podolsk districts of the Moscow government. The peasants are generally engaged in the making of coarse needles, particularly trade needles in the manufacture of which ordinary iron is used for the body, covered with cementation steel. Needles for sewing machines are, so far as known, made only at the manufactory of Count Plater.

Reckoning the average factory price of ordinary Russian needles at 80 kopecks per thousand, and their average number at 125,000 net per pound, the quantity of ordinary sewing needles produced at these four manufactories will amount to 3,700 pounds, and including the wrapping papers, to 4,300 pounds. In reality Russian factories are making also special kinds of needles, such as knitting needles, trade needles and the like; therefore, the output of ordinary needles will be about 3,500 pounds.

The import comprises chiefly ordinary sewing needles. The following table shows the import of ordinary needles, needles for sewing machines and all kinds of special needles, such as knitting needles, embroidery needles and the like, from 1886.

| YEARS.         | SEWING NEEDLES.    |          | SPECIAL NEEDLES.   |          |
|----------------|--------------------|----------|--------------------|----------|
|                | Quantity in pouds. | Roubles. | Quantity in pouds. | Roubles. |
| 1886 . . . . . | 1,102              | 123,093  | 710                | 45,502   |
| 1887 . . . . . | 1,070              | 126,000  | 528                | 42,392   |
| 1888 . . . . . | 984                | 127,799  | 509                | 38,547   |
| 1889 . . . . . | 1,072              | 152,646  | 630                | 40,189   |
| 1890 . . . . . | 1,032              | 172,170  | 461                | 38,114   |
| 1891 . . . . . | 1,399              | 129,082  | 442                | 35,436   |
| 1892 . . . . . | 1,000              | 117,000  | 1,000              | 42,000   |

On comparing the general quantity of needles, sewing machine needles included together with the quantity of smuggled wares of this kind, with the home production, it will be seen that the latter supplies about two-thirds of the yearly consumption in Russia. Finally, screws are made generally at the manufactories, although at Tula and the surrounding villages where mortise locks are made, they form a special branch of household industry.

The largest screw factory is the *Volcano* at Kovno, the yearly output of which reaches 300,000 roubles; another manufactory with a considerable production is situated at St. Petersburg. Although the import of screws is yearly decreasing it is considerable, amounting to 1,000 pouds annually in late years. Nevertheless, it must be borne in mind that the customhouses include under screws all kinds of iron and steel wares having screw cuttings, for example, hooks with screws, rings with screw attachments et cetera.

#### LOCKS, HANDLES, AND OTHER LOCKSMITH WARES.

The manufacture of locks and padlocks, of the latter especially, forms an ancient industry firmly established in some of the governments of Russia; padlocks are mainly made at Pavlovo and the adjoining villages of the governments of Nizhni-Novgorod and Vladimir; mortise locks are chiefly made at Tula and in the adjoining villages. The village Pavlovo, of the government of Nizhni-Novgorod, was renowned already in the beginning of the seventeenth century for the manufacture of padlocks and since then the production has grown to be predominant at Pavlovo, whence it has spread to the other villages of the governments of Nizhni-Novgorod and Vladimir.

The manufacture of locks in Pavlovo is mostly centred in small establishments of household industry the processes of the work being extremely simple and imperfect; for example, the parts of the lock and its outer plates are generally cut out with a chisel; although as they are generally very similar and their variety not very great, they could be easily stamped out, if only with hand stamping machines, and with much better results. The present process exacts much finish, thus tending to increase the prices. Therefore, in order to sell at low prices small makers do not finish their wares to the extent desired,

thus telling of course against the quality of the goods. However, the locks made at Pavlovo have one especially excellent feature, namely, their parts are all soldered together, thus making them strong. Meanwhile, the greatest quantity of the locks brought to Russia from abroad, especially the German makes, have their parts only fastened together with small rivets, and therefore they fail in strength and durability and are regarded as unsafe.

The prices at the local fair for padlocks worked at Pavlovo are generally not high; they vary not only with regard to workmanship, but also according to the thickness and quality of the iron used for the joints. Those of the highest grade, the so-called Swedish locks are sold at 6 roubles per ten pieces, if their weight be 4.5 to 10 pounds; at 8 roubles, if their weight be 20 pounds; and at 15 roubles, if their weight be 37 pounds. The same Swedish locks, but of more ordinary workmanship, made of lighter iron and weighing 10 pounds per ten pieces, are sold notwithstanding their large size, at 3.70 roubles per ten; there are still cheaper sorts, but the qualities are not good at such prices.

The so-called *kornie* or *Tula* locks, having keys in the form of screws, are sold at lower prices; the cheapest, and also the smallest, known by the name of *korobchati* or *sumochni* are sold as follows: the smallest, weighing 6 pounds per hundred, at 2.30 roubles per hundred; and the largest, weighing 15 pounds per hundred, at 4.50 roubles. This kind of locks is chiefly exported to Persia and Turkey.

The technical side of the manufacture of locks in the Pavlovo region, as well as in other localities working padlocks, for example the governments of Vladimir, Viatka and Kostroma, has attained a very small degree of development. Not only, as has already been seen, the stamping process is not used in the cutting out of the joints and parts of the mechanism, but it is also not used at the making of keys, which are made of different pieces, that is to say, the forged ring, the stem made of rolled sheet iron, and the bit are all soldered together. The cause of such indifferent work is chiefly the poverty of the peasant locksmiths who duly appreciate the value of the stamping machines, but who cannot afford to buy them. There are few workmen among kustars so well off as to be able to introduce any improvements in the trade, as the profits of the workmen of Pavlovo engaged in this business are much smaller than in other branches. Such a state of things, however, cannot last long, and will soon be changed with the help of the trade school established recently at Pavlovo, the workshops of which contain the simplest and most comprehensible mechanical contrivances for the shaping of all the parts of the lock. Notwithstanding the low prices, the yearly output of the locksmiths in the Pavlovo region reaches from 500,000 to 600,000 roubles.

The manufacture of mortise locks, centred in Tula and its neighbourhood, is in a much better position, therefore the quality of the wares is of a higher order, not inferior to that of the wares of foreign make. Besides the kustars (peasant smiths) mortise locks are also made at manufactories furnished with mechanical contrivances and having steam motors.

Locks, handles and braces are often made in the same villages, whose number in the Tulska and Novosilsk districts, amounts to 130, thus showing how widely the industry is spread in that locality. Of the manufactories, judged from the amount of



The door locks made in Tula are of three different types and each type is divided into three sorts, plated with latten, without latten but polished, and thirdly only painted; each sort has 7 different numbers, so that the assortment of the door locks alone includes 63 separate numbers. The locks for other uses are also divided in many sorts according to their finish and dimensions; thus, the quantity of locks made in Tula forms a considerable amount, and their prices are from 10 kopecks to 3 roubles and more each.

Passing the detailed examination of the technical side of the manufacture it should be mentioned, however, that the method of work based upon the division of labour has a great influence on the quality of the goods produced. In fact, as has already been mentioned, the ordinary Tula locks being very cheap are nevertheless of a very good quality, exceeding by far the padlocks made at the Pavlovo region. The earnings of the Tula workmen as well are far greater than those of the workmen of the Pavlovo region. Many thousand people are engaged in the making of locks in the Tula neighbourhood, and the sum of the production may be fixed at not less than 3,000,000 to 3,500,000 roubles per annum.

Other locksmith wares, such as hinges, bolts, door knobs, window fastenings, and the like, are made in Tula, as well as in some villages, sometimes together with locks, but always by special makers. The prices of these wares vary greatly according to their quality and dimensions. Thus, for example, the cheapest sort of painted hinges made of light metal and often even of old iron, is sold at 80 kopecks per four hundred, if the length be one and three-quarters inches, and at 2.25 roubles, if the length be 3 inches, their weight being from 10 to 30 pounds; the hinge rod is not made of wire, but of rolled sheet iron. Hinges of the best makes, with wire spindles, if of the same dimensions as the former, are sold from 5 to 10 roubles per four hundred pieces; for the making of such a quantity of the smallest sort, 30 pounds of iron and 8 pounds of wire are used, and 2 pounds of iron and 12 pounds of wire for the largest. The best hinges are plated with latten and highly polished. Now that the *spingalet*, a sort of full length window lock, is largely used over all Russia; their manufacture has been introduced in Tula, as well as in some other towns, especially in St. Petersburg, Warsaw and Odessa.

The quality of the Tula wares, as also that of the locks, is very satisfactory and their prices, very reasonable. The total value of this kind of goods, the production of stove appliances included, may be fixed at not less than 1,000,000 to 1,500,000 roubles yearly.

In addition to Tula the making of this kind of goods forms a part of the household peasant industry in the Vladimir government, although the extent of the output is not particularly large, and painted wares are exclusively made.

The making of locks and other locksmith articles, as a branch of manufacturing, dates only from 1886 and 1887 when such works were established in the Baltic regions. One of these factories, situated in Mitau, government of Courland, produces door and window appliances to the sum of 30,000 roubles yearly; the other, in Riga, government of Livonia, manufactures locks and small locksmith wares to the value of 76,000 roubles annually. These works are supplied with machinery and all the work necessary to their manufacture is done within the walls of the establishments.

Finally, it should be mentioned that locks are also made in a great number

of town factories, but which generally make them of more complex systems and chiefly to order; such locks, being sold per piece, are somewhat dear and the quantity of them worked by the different shops is inconsiderable. Their prices according to the size and combinations vary from 5 to 15 roubles per piece. The chief customers of such establishments are the owners of storehouses and shops.

The quantity and the value of the import of locks of different kinds, with the exclusion of brass locks, which since 1886 are regarded as brass goods, are shown in the following table.

| YEARS.            | WEIGHT MORE THAN 5 POUNDS<br>PER PIECE. |           | WEIGHT LESS THAN 5 POUNDS<br>PER PIECE. |           |
|-------------------|---|-----------|---|-----------|
|                   | Pou ds.                                 | Rou bles. | Pou ds.                                 | Rou bles. |
| 1886 * . . . . .  | —                                       | —         | 13,630                                  | 236,301   |
| 1887. . . . .     | 2,849                                   | 40,105    | 3,443                                   | 71,068    |
| 1888. . . . .     | 2,217                                   | 32,988    | 3,035                                   | 59,323    |
| 1889. . . . .     | 1,747                                   | 25,779    | 6,084                                   | 102,416   |
| 1890. . . . .     | 720                                     | 13,975    | 6,386                                   | 102,462   |
| 1891 ** . . . . . | —                                       | —         | 6,929                                   | 111,237   |
| 1892. . . . .     | —                                       | —         | 6,009                                   | 104,000   |

The growth of the import noticeable in recent years relates exclusively to small locks, which are brought to Russia from Germany and sold mainly in the western region. The prices of these wares are generally very low, therefore they are readily bought, but the quality is very unsatisfactory. The locks imported from England and France belong to the category of compound locks and, although comparatively dear, are of the very best makes.

The locks for safes must be also related to the category of locksmith wares. They are generally made at the establishments where the safes are manufactured. These articles requiring very minute workmanship are made not only at large locksmith establishments, but at some of the manufactories as well. The quality of the safes made in Russia is quite satisfactory, although their prices are higher than those of foreign makes; the same true, also, of the other locksmith wares; still, safes are very seldom imported.

The comparative expense of the locksmith goods produced by Russian makers depends greatly upon the fact that machines for working the metals are little used, while the employment of such means is constantly increasing abroad, especially in Germany and in France. The Russian establishments use equally seldom the stamping process when shaping the different parts of the lock; this also has an influence upon the expense of the wares. Finally, the comparatively small production of malleable

\* These figures include all varieties, brass locks as well as all kinds of screws.

\*\* Since 1891 the locks of both categories, as well as screws, are given in the same customhouse data; the figures for the years 1887 to 1890 relate to locks only.

cast iron, used with such success abroad for the manufacture of various small articles, such as harness, stirrups, spurs and the like, must also be considered as unfavourably influencing the price, as well as the variety of the wares made by the locksmith in Russia.

This industry comprises such a great quantity of articles and in such enormous variety that they are not easily classified. Therefore, it is very difficult to state even approximately the extent and value of this branch of industry. However, it may be safely reckoned at not less than 15 million roubles annually.

The import of locksmith wares is estimated at something over 2 million roubles, as can be seen by the following table. In the column of export, according to custom-house statistics, not only locksmith goods, but all kinds of iron and steel articles are included, such as blacksmith wares, kettles, wire and wire goods, cutlery, zinc and lead manufactures, as well as scythes, sickles and all kinds of instruments.

| YEARS.         | WEIGHT MORE THAN<br>5 POUNDS PER PIECE. |           | WEIGHT LESS THAN<br>5 POUNDS PER PIECE. |          | IMPORTED<br>THROUGH THE<br>EUROPEAN<br>FRONTIER. |
|----------------|---|-----------|---|----------|--|
|                | Pouids.                                 | Roubles.  | Pouids.                                 | Roubles. | Value in<br>roubles.                             |
| 1886 . . . . . | 445,099                                 | 2,870,076 | 46,853                                  | 706,787  | 180,000  |
| 1887 . . . . . | 234,737                                 | 1,406,802 | 46,771                                  | 588,219  | 550,000  |
| 1888 . . . . . | 337,921                                 | 2,857,845 | 43,847                                  | 506,853  | 390,000  |
| 1889 . . . . . | 302,589                                 | 1,597,804 | 55,395                                  | 603,459  | 560,000  |
| 1890 . . . . . | 272,062                                 | 1,588,823 | 45,109                                  | 625,161  | 260,000  |
| 1891 . . . . . | 211,141                                 | 1,703,490 | 52,823                                  | 568,823  | 500,000  |
| 1892 . . . . . | 239,000                                 | 1,623,000 | 42,000                                  | 469,000  | 690,000  |

The figures of this table do not show any considerable fluctuations with regard to the more heavy wares; but a tendency to decrease is noticed; it can, therefore, be stated that the interior demand for such kinds of goods is amply supplied by the home production, notwithstanding the growth of the population.

As a quite new branch of industry, recently established in Russia, the making of steel pens should be mentioned; they are made at the Moscow factory, founded in 1887, by Kroutovski, the output of which is about 50,000 boxes yearly.

The data given in the above review show that the total amount of the metallic wares produced by all the manufactories, trade and household establishments may be put approximately at 120 million roubles per annum, excluding, however, army supplies.

According to the same data it is possible to state the dimensions of the demands of Russia for metallic goods of the groups above reviewed, with the exclusion of equipments for the army and other arms, and to see to what degree the home production in its present condition can satisfy these demands. The following table answers fully the above questions; the figures of import and export relate to 1892.

| KINDS OF WARES.                             | HOME PRO-<br>DUCTION.    | IMPORT. | EXPORT.       | HOME CON-<br>SUMPTION. | SUPPLIED<br>BY HOME<br>PRODUCTION. |
|---|--------------------------|---------|---------------|------------------------|------------------------------------|
|   | In thousands of roubles. |         |               |                        | Per cents.                         |
| Gold and silver goods. .                    | 7,000                    | 809     | 282           | 7,527                  | 94.3                               |
| Wares of brass and its<br>alloys . . . . .  | 16,000                   | 1,874   | 280           | 17,594                 | 90.9                               |
| Wares of zinc, tin and lead                 | 8,500                    | 348     | —             | 8,848                  | 96.0                               |
| Blacksmith wares, iron<br>and tin . . . . . | 27,500                   | 1,511   | —             | 29,011                 | 94.8                               |
| Cast iron and cast steel.                   | 21,000                   | 199 *   | 95 *          | 21,104                 | 99.5                               |
| Cutlery . . . . .                           | 2,425                    | 133     | —             | 2,558                  | 94.8                               |
| Implements and tools . .                    | 500 **                   | 1,871   | —             | 2,371                  | 21.1                               |
| Scythes and sickles. . .                    | 275                      | 1,757   | —             | 2,032                  | 13.5                               |
| Wire and wire goods . .                     | 22,500                   | 2,117   | —             | 24,617                 | 91.4                               |
| Locks and locksmith wares                   | 15,000                   | 2,396   | 692 ***       | 16,704                 | 89.2                               |
| Total in millions . .                       | 120                      | 13      | $\frac{1}{3}$ | 132                    | 91                                 |

The data relating to the present condition of the metal industry in Russia, not including machinery, all kinds of apparatus, appliances, materials for ship building and for all sorts of conveyances, lead to the following conclusions:

1. The manufacture of war appliances chiefly made at the Crown manufactories, although private factories work also some such articles, has attained a high degree of perfection, not inferior to that of the best foreign works.

2. The manufacture of cutlery, the casting of bells, the making of silver wares and of most of the wire goods, must be regarded as among the most successful branches of the industry, supplying largely the home demands.

3. The fabrication of locks is well established although the manufacture of mortise locks and padlocks, owing to the poverty of the workmen, is rather poorly developed; this industry, even if it retain its household character, always tending to cheapen the goods, is capable of great development, especially if it were managed by more well to do persons.

4. The making of ordinary brass and locksmith wares, as well as that of enamelled plate, tin and zinc goods, is on the whole satisfactory, although the manufacturers should direct their attention to increasing the use of technical machinery, such as the stamping apparatus, and to the producing of a greater variety of makes. As much may be said with regard to bronze, in as much as the production of ornamental bronze goods, and of articles of the fine arts, leaves much yet to be desired. Other wares of bronze used by bookbinders and joiners are, as yet, only of second grade.

\* These figures show the value of the import according to customhouse data.

\*\* The approximate amount of the output.

\*\*\* Including the export of tin wares, amounting to 6,000 roubles, according to the statistics of the customhouse.



5. The manufacture of blacksmith wares is in a satisfactory condition, but a more general use of the stamping process is desirable.

6. The production of scythes, sickles, and other implements, is in a very poor position, being unable to satisfy the home demands. The quality of the wares, especially of those produced at household establishments, leaves also much to be desired. The scarcity of steel and the defects in its quality, are greatly retarding the development of this branch of industry so necessary to Russia.

Finally, it must be said that in order to attain a high degree of perfection in the manufacture of metallic wares, Russia must produce the metals of first importance, such as iron and steel, in more various assortments than at present, especially in the works situated in the Urals.



## CHAPTER X.

**Machines and Implements.**

**T**HE manufacture of machines in Russia began in the end of the seventeenth and in the beginning of the eighteenth centuries by the construction of apparatus for the mining works then established, due to the iron will of Peter the Great, which never weakened before any obstacles whatever when the honour and welfare of Russia were at stake. The manufactories founded by him at Olonets not far from St. Petersburg, and having an easy communication therewith by water, furnished the Russian army and navy with guns and other equipments, and served at the same time to introduce technical inventions; the articles made at these factories served as models to those that were established later.

The gifted coadjutors of Peter the Great in the introduction of the mining industry, which was closely followed by machine building in Russia, were Henning, a foreigner, and the blacksmith Demidov, the founder of the still-existing works in the Urals, which bear his name. In 1786 a Scotchman, Haskoyn by name, who was induced by Catherine the Great to come to Russia, established new works in the region of Olonets with the help of the local foreman Yartsov. In this manufactory the founding of cast iron guns and the mechanical processes relating thereto were introduced; and in 1790 the first Russian steam engine of the Watts pattern was built. With the aid of Haskoyn, the Crown foundries were built near St. Petersburg; these works developed later into the great establishments known as the Cronstadt and the Izhora machine works, which are until now supplying the different needs of the Russian navy. The Izhora factories among other works produce at the present time steel-iron armor plates.

In 1805 the Alexandrovsk spinning manufactory was founded in St. Petersburg; it was for a long time under the management of Wilson, who had supplanted Haskoyn. Although the influence of this establishment upon the development of weaving and spinning by means of machinery in Russia was inconsiderable, still it was here

that the looms for many of the Russian factories were made, when the English Government forbade the export of such machines, lasting until 1843.

The first private machine factory was founded in 1790 in St. Petersburg by Berd. This establishment contributed greatly to the spreading of steam engines and especially of steamboats, Berd having in 1817 received an exclusive patent for their manufacture. It was here also that the making of different appliances, especially machine tools for working metals, was first established. At the present time these works, known by the name of the Franco-Russian Manufactory, belong to a French Co., and are engaged in ship building, in the construction of different kinds of steam engines and boilers, as well as in other works connected therewith.

Of the most ancient machine manufactories the Wilson works in Moscow, founded in 1802 for the making of agricultural implements, must be mentioned, as also the factory of Krivorotov Brothers, founded in 1815, in the vicinity of Moscow, and that of Lilpope and Raw, founded in 1818 in Warsaw, originally devoted to the same purpose; the latter is at the present time engaged in the manufacture of railway cars and accessories. Furthermore, in 1824 there was founded in St. Petersburg by Iliis a factory for building steam engines and kindred machinery.

The movement of Russia with regard to machine building until 1825 was limited to the above mentioned factories, if the mechanical establishments at some of the mining works be excepted, where besides repairs certain new articles were made. It must be mentioned, however, that in the whole of Europe, England excepted, machine building was at the time a recently established and slowly developing industry, due chiefly to the wars, which lasted until 1814.

After 1825 the industry in Russia began to develop, but somewhat slowly, especially in comparison with its rapid growth in other countries, France and Belgium being first among all. The industry was already firmly established and had attained a certain degree of perfection abroad, due to high tariffs. In Russia, however, the import of machinery was duty free, and the protective and even prohibitory tariffs on cast iron and iron, established in order to further the home production, retarded still more the development of machine building in Russia by raising the prices on materials of the first importance.

One of the most celebrated manufactories founded during that period was the Alexandrovsk Crown Iron Casting and Mechanical Works in St. Petersburg, built in 1825. The machines of this factory were prime and served as models, and it often furnished foremen of large experience to other manufactories. Later on, this establishment turned its activity into another channel, namely, the building of the railroad between the two capitals. In 1844 its management was given over to The American Co. in order to found in Russia the building of locomotive engines; but this business could not be then firmly established as there was but little demand for such engines, the railroads being at that time very limited in the Empire. During a period of 24 years The American Co. built in all 200 locomotives, 253 railway passenger cars and 2,700 freight and platform cars. Now this factory is under the control of the Chief Company of Russian railways.

Of the other factories established during this period a somewhat conspicuous place with regard to machine building was held by the factory of Nobel, which worked different kinds of machinery, and by that of the Duke of Leichtenberg, where

the attempt at building locomotives proved still less successful than at the Alexandrovsk works, and which was given over to the railway uniting St. Petersburg to Warsaw. Furthermore, machine building was carried on at the manufactory of Ogarév, now bearing the name of Poutilov, after one of its former owners, an energetic promoter of the metal industry, and of new technical undertakings. At the last-named works some portable engines were built during that time, but in general the industry did not take root there; at the present time the movement of this factory is vast and various; it is rolling iron and steel, especially rails, manufacturing railway appliances and cars, as well as small steamers, torpedo boats and implements of war, especially gun carriages and supplies.

In Moscow and in central Russia the following factories were established during this period: that of Butenop, now owned by Liphardt, for the making of agricultural implements; that of Dobrov and Nabholz, for building various machines; that of Maltsev, for the manufacture of different farming tools, in which the building of railway cars and locomotives was recently established, but soon stopped; that of Shipov, engaged in building steamers, and which supplied the Russian manufactories with steam motors; and lastly, the Sormovsk, founded also for the purpose of building steamboats, and in which it is still engaged, together with the building of railway cars and the making of railway appliances. In the southern part of Russia the building of various kinds of machines was carried on at the Crown works in Lougansk and Odessa, and at those of Zaslavski, of Falk, and of Count Bobrinsky. The Government in order to further the development of machine building organized also in the Urals a manufactory well equipped for that time at Ekaterinburg, which supplied afterwards the local factories with steam and air engines, and machine tools; at the same time machine building was established at the Votkinsk works, now having a very various production, working iron, railway appliances, steamboats, agricultural implements, and locomotives. Some smaller factories for machine building were established during the same period on the coasts of the Baltic Sea and in the region of Poland.

Machine building, until 1850, was chiefly developed and perfected at the Crown manufactories, or where it was aided by subsidies and orders from the Government. Upon the whole, however, the production of the private establishments was feeble, and necessarily so at that time, when machinery was imported into Russia duty free and the prices for iron and cast iron were so high that competition with foreign built machines was always hazardous and often ruinous. According to official data, in 1850 there were 25 private machine factories, employing 1,475 hands, turning out machinery to the value of 423,390 roubles, or 326,857 dollars, reckoning by the exchange of that date. The import of foreign machinery amounted at the same time to 2,315,000 roubles, or 1,787,180 dollars.

Although in the beginning of the fifties some new private works were established, they had however, but little influence upon the development of machine building in Russia at that period as compared with that of the other European countries, which had already attained a considerable degree of perfection. The consequences of such slow progress were plainly seen in the Crimean war, taking place at that time, Russia having neither a sufficient or a competent navy, nor suitable arms for infantry, and in both of these essentials her enemies were well and fully

supplied. Owing to the poor development of machine building in Russia, the Government was compelled to put forth the most extraordinary efforts in order to cover to some extent the defects of the navy and general army. During this period the private manufactories situated near St. Petersburg, with the aid of different small mechanical workshops, built in the space of 14 months, 103 steam engines for the navy, yielding a total of 15,000 horse powers; but such hurried workmanship at manufactories and establishments not properly fitted out for the purpose, of course could not be without many defects of construction.

At the end of the Crimean war, which coincided with the accession to the throne of the Emperor Alexander II, Russia's productive forces began to develop, increasing the demands for iron and cast iron; this demand increased very considerably due to the building of railroads, the development of the navy and the change in the equipment of the army. As the home production of iron and cast iron was not able to supply the growing demands in Russia, in 1857 the Government permitted the import by sea of these metals, and which until then had been prohibited, but with a very high duty thereon, considerably lowered, however in 1859.

Under these conditions, although not furthering the development of machine building to any considerable extent, the number of private machine works, according to official data, rose in 1860 to 92, employing 1,862 hands, the output being valued at 846,215 roubles. During that period the smallest figure of import, namely to the value of 513,505 roubles, was in 1854, as is easily explained by the Crimean war, after which it rapidly increased, reaching in 1859 over 11 million roubles; but in 1860 it decreased again to 8,526,653 roubles and there remained for several years.

The growth of the number of factories during the decade above reviewed, with a comparatively small increase of hands employed, is explained by the fact that in the interior of Russia only small establishments in general were organized, making agricultural implements and machines, besides all kinds of repairs. However, some of the powerful Russian manufactories were also established during that period, due chiefly to Government orders and to the increase of private trade companies; but the production of these works was then not definite.

Of the manufactories founded at that time in St. Petersburg the following are the most conspicuous: the Nevsk, now engaged in ship building, and especially in making locomotives; that of Mackferson, now called the Baltic, engaged in building Men of War; that of San-Galli, which builds steam engines and various other machinery, besides producing cast iron building materials; that of Lessner, formerly established for making printing presses and lithographic machines, and now engaged in the more profitable branch of building steam engines and machine tools for working metals. In central Russia the machine works of Bromley were founded, as well as some factories for building steamboats; in Astrakhan the large workshops of The Caucasus and Mercury Navigation Co. were erected at the mouth of the Volga, the largest of Russian rivers; another factory was founded by The Russian Navigation and Trade Co., on the coast of the Black Sea at Sebastopol, where during the Crimean war the Russian forces gallantly sustained a long and severe siege; at the same time Crown workshops were established at Nikolaevsk at the mouth of the Amour.

From 1860 to 1870 the Government, anxious to further the machine building industry, instituted a series of measures to that end. In 1861 the machine works, run

by steam and water propellers, were allowed to import their iron and cast iron, to the extent required, free of duty. In 1866 an order was issued exacting the home manufacture of all railway appliances, notwithstanding the difficulties that might be engendered thereby. In 1869 a customs tariff for machinery was introduced; but the import of agricultural implements and machines used in the working up of materials employed in cloth manufactories and paper mills, as well as of printing presses, however, was left duty free. The taxes were in general very light, 30 kopecks per pound, 9.57 dollars per ton, of cast iron and iron machinery, and 75 kopecks per pound, 24 dollars per ton, of locomotive engines, brass apparatus and brass parts of machinery. These small duties did not have any great influence upon the development of machine building in Russia by themselves, but when the fact that the franchise granted in 1861 to some manufactories to import iron and cast iron free of duty still remained in force, is considered, another view presents itself. Due to the latter influence, as well as to the growth of railway lines, and to the constant orders from the Crown, the activity of the machine works in Russia visibly increased. The emancipation of the serfs, happily accomplished in 1861 in the name of justice and humanity by the noble hand of Alexander II, also contributed greatly to the promotion of machine building in the Empire. This humane act removed the great obstacle in the way of the growth and development of machinery for agricultural purposes, namely, the gratuitous labour of the serfs, since which time the demand for such machines has greatly increased. Although the feeble local production of machines and implements of husbandry could not satisfy the home demand, and although a large field was opened to the import of such goods, still the increasing demand turned many small factories, which were formerly engaged only in repairs, to the building of new machinery, and formed a somewhat considerable group of works wholly engaged in the manufacture of agricultural implements and without the aid of the Government, which was given only in 1885.

Of the most considerable manufactories established between 1860 to 1870 in St. Petersburg and existing until now, are the Machine Works of Nobel, and the Oboukhovsk Steel Casting and Gun Manufactory; in Moscow, the factories of List, Perenood and Veiheit, for different kinds of machinery; near Moscow, that of Struve, now called the Kolomensk, where at the present time locomotive engines are produced on a large scale, as well as railway cars and various railway appliances; this manufactory also formerly produced portable engines and machines of husbandry. Many factories were established at that time also in the south of Russia; and near the Urals, the Perm Crown Works for manufacturing guns and for casting steel were then organized.

According to official data there were in all European Russia in 1870, 145 private machine factories with 27,117 hands employed, and with an output of 27,391,755 roubles, 16,746,434 dollars, per year. During this time the constantly growing import of foreign machinery raised to 37,576,654 roubles, or 28,987,177 dollars, the foreign exchange of the paper rouble being at that time 77 cents. The period from 1870 to 1880 proved equally favourable to the development of machine building in Russia, excepting such kinds of machinery as were imported duty free. Among the measures favourable to the machine industry, already protected by a customs tariff, together with the franchise of receiving iron and cast iron free of duty, should be mentioned the order of the Government, issued in 1876, concerning the increase of

the taxes levied on locomotives to 1.25 roubles per pound, about 40 dollars per ton, and to 50 kopecks per pound, or 16 dollars per ton, on tenders, and that issued in 1879, ordering that duties be levied in gold instead of paper roubles, the nominal tariff remaining unchanged, thus considerably increasing the duties and leading to a better protection of the home production, as the paper rouble was depreciated.

In 1880 according to official data there were in European Russia already 237 factories, employing 56,105 hands, and their output was estimated at 72,289,200 roubles, or according to the exchange of the paper rouble of that year, 51.46 cents, at 37,228,938 dollars yearly; the import of foreign machinery, although there were some fluctuations during the decade, amounted at the same time to 67,345,477 roubles, or 34,682,900 dollars.

From 1881, machine building in Russia was under still more favourable conditions, greatly protecting its development. The unsatisfactory state of the finances compelled the Government to seek new means of income, among which attention was drawn to the customhouse revenues. The tariff of that year raised the duty levied on machinery; on the machines formerly imported duty free, such as spinning and weaving machines, printing presses and paper mill machinery, the same duty was levied as on all other kinds; only farming machines and implements were admitted free, it being considered undesirable to impose such a tax upon agriculture.

With the raising, in 1881, of the customs duties on iron and cast iron machinery to 80 kopecks in gold per pound, 25.52 dollars per ton, the franchise given to the machine works to import iron and cast iron duty free was also abolished, this measure extending equally to the factories producing agricultural machines, and sacrificing the industry still more to such machinery of foreign make as were imported free of duty. The import of such goods increased, of course, and in 1884 was over one million of pounds, or 25,000 tons. Such an unfavourable condition of the manufacture of machines of husbandry in Russia compelled many of the larger firms to renounce the production of such goods and to turn their attention to other channels.

Further measures of the Russian Government in favour of the development of machine building consisted of a series of orders tending to increase the duties levied on imported machinery and unwrought metals, the latter measure being considered as indispensable for the furthering of the development of the home production. Seeing the increase of duty upon unwrought metals, and taking into consideration the petition of the manufacturers engaged in the making of farming machines, the Russian Government decided at last to install, in 1885, for the first time, a customs duty upon such machines, of 50 kopecks in gold per pound, 20.90 dollars per ton, this duty being later on raised to 70 kopecks in gold per pound, 33.52 dollars per ton. Of course, so small a duty could not have much protective influence; it only prevented the complete ruin of those small manufacturers of this kind of machines whose welfare depended upon the production of such goods, and who owing to local conditions and poor technical means were unable to begin more profitable undertakings. Although these modest workmen, compensating themselves to some extent by the repair of machinery, produce new machines, which find a ready market due to the high price at which foreign makes are sold in Russia, still they are unable to establish the building of agricultural machines upon a firm basis in Russia so long as the import of foreign manufactures is practically free.

The decade 1880 to 1890 was in general not very favourable to the manufacture of machinery in consequence of the instability of the tariff and of the general standstill of affairs due to the painful events Russia had to undergo during this period, and to the solicitude of the Government to bring the Russian finances to a more satisfactory condition, which was influencing greatly the decrease of Crown and railway orders. Owing to these conditions the activity of the largest and most productive of the manufactories was lowered, but the number of small establishments, called forth by the pressing needs of life, increased considerably.

The conditions of Russian machine building at the end of this period with regard to foreign competition were as follows. The custom duties upon the imported unwrought metals were: upon cast iron, 15 kopecks in gold per pound, 4.785 dollars per ton, and upon iron, 40 to 60 kopecks in gold per pound, from 12.76 to 19.14 dollars per ton. The custom duties upon imported machinery were: for agricultural machines, 50 to 70 kopecks in gold per pound, from 15.95 to 20.90 dollars per ton; extra parts of such machines were imported with a duty from 1.8 to 2.4, and in some cases to 5 times that above mentioned. The duty upon iron and cast iron machinery, excepting agricultural machines and locomotives, and upon the extra parts of such machinery, the brass parts excluded, was 1.20 roubles in gold per pound, 38.28 dollars per ton. The duty on locomotives was 1.40 roubles in gold per pound, 44.66 dollars per ton. Brass machinery and apparatus in which brass forms the chief material, with regard to weight, as well as extra parts of such machinery, were imported with a duty of 3.50 roubles in gold per pound, 111.65 dollars per ton. On comparing these duties with those first established in 1868 in paper roubles, it will be seen that they were four times as large, and considering that the duties were levied in gold, six times higher than the former.

The import of foreign machinery during this decade was as follows:

| Y E A R S.     | I M P O R T.           |           |  |           |              |          |   |          |
|----------------|------------------------|-----------|--|-----------|--------------|----------|---|----------|
|                | Agricultural machines. |           | All kinds of machines except those mentioned separately. |           | Locomotives. |          | Machines and apparatus wholly or principally made of brass. |          |
|                | Tons.                  | Dollars.  | Tons.  | Dollars.  | Tons.        | Dollars. | Tons.   | Dollars. |
| 1881 . . . . . | 136,678                | 4,053,220 | 22,774   | 7,794,010 | —            | —        | 107 *   | 60,255 * |
| 1883 . . . . . | 15,984                 | 2,367,755 | 30,065   | 9,948,680 | 97           | 59,225   | 80  | 52,530   |
| 1885 . . . . . | 7,837                  | 1,260,320 | 21,693   | 5,892,025 | 403          | 96,305   | 113   | 60,255   |
| 1887 . . . . . | 5,629                  | 897,130   | 21,629   | 6,680,065 | 177          | 42,745   | 177   | 105,060  |
| 1889 . . . . . | 9,548                  | 1,523,370 | 33,516   | 9,910,145 | 56           | 18,540   | 161   | 107,605  |
| 1890 . . . . . | 7,435                  | 1,297,285 | 31,048   | 9,124,255 | 80           | 35,535   | 177   | 125,660  |

\* In these figures the import of locomotives in 1881 is included.



The state of the machine building industry during this period, characterizing its present condition as well, can be seen from the following data on the number of factories and hands employed, and on the value of the home production for the years 1885, 1887, 1889 and 1890.

| YEARS.          | LOCALITIES OF THE FACTORIES. | NUMBER OF FACTORIES. | NUMBER OF HANDS. | VALUE OF PRODUCTION. |            |
|-----------------|------------------------------|----------------------|------------------|----------------------|------------|
|                 |                              |                      |                  | Paper roubles.       | Dollars.   |
| 1885.           | European Russia . . .        | 266                  | 37,918           | 34,978,000           | 18,013,670 |
|                 | Poland . . . . .             | 70                   | 4,854            | 6,372,000            | 3,281,580  |
|                 | Total . . . . .              | 336                  | 42,772           | 41,350,000           | 21,295,250 |
| 1887.           | European Russia . . .        | 302                  | 40,701           | 41,793,000           | 21,523,395 |
|                 | Poland . . . . .             | 68                   | 5,405            | 7,616,000            | 3,692,240  |
|                 | Caucasus . . . . .           | 10                   | 410              | 312,000              | 160,680    |
|                 | Siberia . . . . .            | 2                    | 302              | 222,000              | 114,330    |
| Total . . . . . | 382                          | 46,818               | 49,943,000       | 25,720,645           |            |
| 1889.           | European Russia . . .        | 331                  | 44,360           | 46,882,000           | 24,144,230 |
|                 | Poland . . . . .             | 60                   | 4,908            | 7,784,000            | 4,008,760  |
|                 | Caucasus . . . . .           | 10                   | 831              | 1,076,000            | 554,140    |
|                 | Siberia . . . . .            | 4                    | 319              | 416,000              | 214,240    |
| Total . . . . . | 405                          | 50,418               | 56,158,000       | 28,921,370           |            |
| 1890.           | European Russia . . .        | 338                  | 43,328           | 42,669,000           | 21,974,535 |
|                 | Poland . . . . .             | 57                   | 4,241            | 5,907,000            | 3,042,105  |
|                 | Caucasus . . . . .           | 13                   | 1,213            | 1,131,000            | 582,465    |
|                 | Siberia . . . . .            | 4                    | 300              | 204,000              | 105,060    |
| Total . . . . . | 412                          | 49,082               | 49,911,000       | 25,704,165           |            |

Furthermore, some other manufactories, which having other specialities cannot be called machine works, are engaged in the industry; according to official data for 1890, 17 such factories were occupied with machine building, their yearly output amounting to 2,731,000 paper roubles. In order to give an idea of the present condition of machine building in Russia it should be mentioned that the manufactories engaged in this industry were moved by 63 water propellers, and 539 steam engines having 658 steam boilers, the total amounting to 10,990 steam powers.

Of the persons having received technical education and having the management of the manufactories in 1890, there were 221 Russians and 100 foreigners, and

of the managers without any special technical education, 250 were Russians and 51 foreigners. Persons not having received any special technical education generally have the management of small factories, chiefly engaged in the repair of machinery and building of agricultural machines not requiring any special scientific knowledge.

The price of labour varies greatly according to the local conditions, to the kind of work and to the degree of its perfection, from 50 kopecks to 3 roubles and more per day. Locksmiths, turners and workmen, running punching and planing machines, and the like, seldom receive less than a rouble, and generally more than that. On all possible occasions payment per piece takes the place of that per day, to the profit of both parties. Day labour for adults consists of 12, rarely of 10 hours.

After what has been said above, a brief look into the development of machine building in the Empire will prove of some interest, therefore the following table is here annexed to show the activity of the industry in European Russia, Finland, Poland, Caucasus, (Siberia and Turkestan excluded) for the period from 1850 to 1890. The data of 1850 are reckoned as a unit, and in the columns of the succeeding years the coefficients are placed, showing how many times the number of factories, of hands employed, and the value of home production, and that of the imported machines, has increased during these years as compared with 1850.

| THE GROWTH OF MACHINE BUILDING. |  |        |       |       |        |        |        |       |       |       |       |        |        |
|---------------------------------|--|--------|-------|-------|--------|--------|--------|-------|-------|-------|-------|--------|--------|
| 1850.                           |  | YEARS. |       |       |        |        |        |       |       |       |       |        |        |
|                                 |  | 1850   | 1860  | 1870  | 1880   | 1882   | 1883   | 1884  | 1885  | 1886  | 1887  | 1889   | 1890   |
| 25                              | Number of factories. .                     | 1      | 3.96  | 5.80  | 9.45   | 9.36   | 9.52   | 10.44 | 10.64 | 11.12 | 12.08 | 13.24  | 13.52  |
| 1,475                           | Number of hands. . .                       | 1      | 7.19  | 18.31 | 31.26  | 30.37  | 29.95  | 28.00 | 25.71 | 28.46 | 27.59 | 30.07  | 29.37  |
| 423,390                         | Value of the home production in roubles. . | 1      | 18.78 | 64.70 | 170.40 | 109.90 | 100.96 | 92.47 | 82.61 | 62.76 | 98.71 | 100.71 | 100.78 |
| 2,315,000                       | Value of the import in roubles. .          | 1      | 3.68  | 16.20 | 29.10  | 9.03   | 8.52   | 9.78  | 6.21  | 6.28  | 6.47  | 9.70   | 8.88   |

It can be seen from the foregoing that the growth of machine building in Russia is on the average very satisfactory, the slow progress during the last decade being due exclusively to the conditions mentioned above. It should be said, however, that the development of this industry in Russia would have been still more rapid if it could have been earlier protected from the competition of foreign machinery. It would be unreasonable, however, to complain of the results, especially on considering that the Russian Government, having in view the public interest, made every effort to establish

first the manufacturing industry, exacting machinery as cheap and as near to perfection as possible.

Turning to the peculiarities of Russian machine manufacture it should be mentioned that not all the forms are as yet introduced in Russia, and that some of the existing branches of the industry are lacking in perfection and development; many of the others, however, are so satisfactory that they enable Russia to be more or less independent of foreign manufactories.

As agricultural machines will be treated in a special review, those of other categories are only to be mentioned here. Spinning and weaving machines and machinery for paper mills and printing establishments, as mentioned above, have been for a long time imported duty free; a small tax had been levied on them and only since 1885 was it raised sufficiently to enable Russian works to manufacture more liberally the most necessary and simple forms of machinery; but this production is as yet not firmly established, the previous efforts in this direction, as has already been seen, being unsuccessful, and at best leading only to a modification of the work.

Machine tools for working metals are built by many Russian works, the most conspicuous place among which with regard to quality, is held by the factory of Lessner in St. Petersburg, and those of Veihelt and Bromley in Moscow. Machine tools for working wood are made in Russia of such kinds as are more generally used, such as sawing machinery; other machines of this category were seldom made, and their production is very little developed, especially that of planing machines. Machines for working metals in the heated state, such as steam hammers and rolling machines, are successfully worked at the Russian factories. Portable engines, although the duty levied upon them was very small until 1880, had been built even before then at the factories of central Russia, namely at the Ludinovsk manufactory of Maltsev and Co., and at the Kolomensk factory, but with no great success; in 1885 the duty was considerably raised, but still the import of portable engines of foreign make, of new types, combining lightness with power, was found profitable by the dealers.

Steam fire engines are made in Russia but in an inconsiderable number, the demand being not large; the making of steam and hand pumps is developed in many factories. Stationary engines and engines for steamboats have been made for many years and successfully in the Empire, because their weight being great their production afforded competition with the foreign makes. Gas motors are until now exclusively imported; the building of kerosene motors, however, has been established at some of the Russian manufactories.

The construction of locomotives is placed upon a firm footing already; the factories, the Nevsk in St. Petersburg, the Kolomensk and Briansk in central Russia, and the Votkinsk in the Urals, can easily build over 300 engines of the 8-wheel compound system per year. The railway appliances of the rolling stock are also made at some of the factories; of these the Poutilovsk in St. Petersburg, the Kolomensk, Briansk, Sormovsk, and that of Maltsev and Co. in central Russia, the factory of Lilpope near Warsaw, and of the Baltic near Riga, are also making railway cars, their yearly output amounting to over 10,000 freight cars. Railway appliances for the rolling stock are also made at the numerous railway workshops, not reckoned in the number of Rus-

sian factories, although most of the shops of the Russian railways are well equipped and well organized establishments. The making of brass apparatus and brass parts of machinery is also greatly increasing in Russia.

In closing this review of machine manufacturing in Russia it would be unpardonable not to mention that the tariff of 1891, after having been carefully revised, has been ratified by the Emperor, and will still further the development and tend toward the perfection of the manufacturing industry in all its branches. This measure together with the constant solicitude on the development of scientific and technical knowledge shows how much has already been done to advance the productive forces of Russia in general, and to support machine building in particular, which is now protected by the recently established tariff. There has not been sufficient time as yet to feel the influence of the new protective policy, but it undoubtedly can be expected that the prices and the quality of goods produced in Russia, machinery in particular, will soon reach a normal state, owing to the development of the production and to the competition duly following it, establishing proper relations between the consumer and the producer. Such was the growth of manufacture and trade in other countries, and following the unchangeable laws of progress, such will be the course of their further development in Russia.



## CHAPTER XI.

## Glass Wares.

**T**HE first glass works in Russia were founded 250 years ago during the reign of the first Tsar of the Romanov family, Mikhail Fedorovich. It was at the time when Bohemia was excelling Venetia in this industry and throwing glass goods of excellent and beautiful quality upon all the European markets. The fall of Venetia was approaching, as also the time when the classical industry of that country was to become general, due to the spread of glass workmen over all Europe, to the profit of the contemporary trade of other nations. At the close of that period, namely in the second half of the eighteenth century, the Venetians and Hungarians served in Russia, as well as in other countries, to develop the artistic elements of the glass industry. This important event in Russia was contemporaneous with a general waking up and development of other trade interests.

During the reign of Peter the Great, at the beginning of the eighteenth century, was founded the Imperial Glass Works, and later on, some special branches of the industry were developed, and several other State factories established. Soon after the death of the first Russian Emperor, during the peaceful period of the reign of Catherine the Great, the real beginning of the glass trade was laid on a firm foundation in Russia, and developed by the aid of the higher classes of society, feeling the influence and impetus given to the industry by Peter the Great. Moreover, certain learned men of the Moscow University founded, by the aid of Empress Elizabeth, the predecessor of Catherine, and of the Academy of Sciences, did much to push and develop the industry. In the remarkable awakening of Russian trade and manufacture of that time was seen the character of the epoch; it was in the second half of the last century, in the days of Watteau, Franklin and Lavoisier.

The following remarks on the introduction of glass works into Russia, on the general character of the times, and of the different Russian promoters, is given by a distinguished writer, who had made a special study of the different trade interests of Russia:

«The second half of the last century was signalized by the development of the glass industry and by the production of the highest grades of wares, such as crystal, Venetian glass, filigree and glass tissue. The principal motive for the intro-

duction was a most sincere and earnest desire to develop the home trade and to raise its standard by joining to it new and related branches of independent industries. With this desire many promoters of that time were thoroughly imbued. Amongst them were some who were possessed of an inborn genius and love of technique; being also endowed with great energy they became powerful movers in the trade development of the Empire.

«The principal characteristic of these promoters was, amongst other things, the capacity of influencing others to take an active part in the development and in the fruits of the new industry as directed by their own labours. Their thirst for activity extended much farther than to the satisfying of their own personal interests; they invited cooperation by publishing articles on the profitable character of the glass trade, by describing their own factories to all comers, and thus exerted a great influence upon the industry. In a word, these men were exemplary promoters, who have left as a noble inheritance their worthy examples to inspire contemporary and future generations».

Amongst these promoters was Ivan Akimovich Maltsev, the principal founder of the best and most ancient groups of Russian glass works. He is also known as the introducer of the beet sugar industry and of engine building in the Empire. The factories of Maltsev, which were first founded in the sixties of the last century, developed and increased during the life of Ivan Akimovich, as also during that of his two heirs, his son Sergei Ivanovich, and his nephew, Ivan Sergeevich, his son having inherited his farther's perseverance and untiring activity in developing factories already established, and in founding new ones. The works of Maltsev are divided into two groups: the original, in the governments of Oriol, Kaluga and Smolensk, and the eastern, in the governments of Vladimir and Riazan. On the other hand, the introduction of the manufacture of artistic glass was favourably influenced by the high education and the love for art of the highest order among a number of people possessing a decided talent for technique; and many establishments were founded in Russia by persons of that class. Simultaneously with the Maltsev works, another glass manufactory was founded by Alexei Nikolaievich Bakhmetiev in 1764, in the government of Penza. This establishment, called Nikolski Crystal Works, belonging at the present time to Prince A. D. Obolenski, was remarkable for its manufactures of especially artistic Venetian glass, some of which has survived till now, and for some ornamental products in coloured glass, as also some imitation of artistic filigree work.

Later on, the conditions of the time and the demands of the market changed. Only that work survived which from the very beginning, or later on, was directed to the satisfying of the more positive necessities of life, and which continued to increase with the change in the character of the markets. Those ancient works, however, in which artistic glass was manufactured, have retained their influence on the entire history of the glass industry. Their traditions, passing from one generation of workmen to another, have tended much to elevate glass manufacture in the different regions, even in those engaged exclusively in supplying the most ordinary demands.

In Siberia, glass works were founded very early. One of the the most ancient manufactories in Siberia, near Tobolsk, in the village Aremzianka, produced glass by the commonest means of that time, with the aid of wood ash and local potash. It

belonged to the family Korniliev, and the last manager of it was Mrs. M. D. Mendeleeff, born Korniliev. After her departure, and after the fire which laid waste the frontiers, this factory was closed. The discovery made by the academian Laxman, in 1764, which was described in a pamphlet in 1795 and which had a great influence on the whole glass industry, was also very early put to use in Siberia. Laxman discovered that sulphate of sodium, which is always cheaper than soda, could be successfully employed in the manufacture of glass. Coincident with that discovery sulphate of sodium was found in Siberia, where it was known under the name of *goudshir*, in very large quantities in the lakes, and glass began to be manufactured with the aid of this salt. Sulphate of sodium is also found in nature in European Russia, in the government of Astrakhan. A merchant named Shilkin, in the government of Nerchinsk near the lake Chagan Nor, opened the industry in 1781, and later on, Laxman together with a merchant Baranov founded in 1784 new glass works near Irkutsk. Several years after, the Siberian *goudshir* served as material for the local manufacture of soda and of soap, at the works of M. B. Prang in the district of Minussinsk.

Soon after the foundation of the manufactories of Maltsev the number of glass works increased in Russia very rapidly. The most ancient of them, some of which have till now retained their former places, were organized in the government of Vladimir, the central point between the two principal Russian markets, Moscow and Nizhni-Novgorod. They principally produced glass for table service; the works of Maltsev also made sheet glass which continued for many years in general demand. Later on, a north-central group of factories was formed where the manufacture of window glass became highly developed. That group consisted of works situated near the railroad leading from Moscow to St. Petersburg, in the governments of Tver, Novgorod and of St. Petersburg. On both sides of these two centres, the northern and southern, the manufacture of sheet glass was developed in the far eastern governments, Viatka and Perm, and in the south-east, in the government of the Volyn, where also the industry has existed from ancient times.

Some special branches of glass manufacture were introduced into Russia by some foreigners at the beginning of the present century. The necessity of procuring wares or apothecaries and laboratories resulted in the foundation of a factory for the making of chemical utensils. Such a factory was founded in 1880 by Ruting near St. Petersburg, district of Tsarskoe Selo, in the village Orfino, and till now it has done much to develop the experimental science in Russia. Looking glasses have been made at the Imperial Glass Works of St. Petersburg, at the Crown factory in Viborg, and to some extent at those of Maltsev. They are mostly blown or Venetian mirrors. The founders of private looking glass industry were foreigners, who organized works in Livonia near Yuriev in 1792, and one in the government of Riazan in 1780, called the Kiritsk works. At the present time the last named factory belongs to the family Smolianinov. Later on, the Government works ceased to manufacture looking glasses and the number of private factories have not increased; generally speaking, the industry is but poorly developed in the Empire. Besides the articles of daily necessity, such as white service glass, sheet glass of different sorts, and bottles, the favourite objects of the Russian glass industry are, until the present day, Bohemian crystal, that is, glass of high quality made with the aid of potash and lime, plain and figured, and white Bohemian sheet glass of high grade. The abundance of potash and the

good quality of sand in the different parts of Russia have influenced the development of the industry. As to leaden glass alloys they are principally used for the production of coloured articles of high quality; and clear leaden, or the so-called French crystal, is being produced only of late in some Russian factories.

In 1850 there were in all 200 glass and crystal works in Russia; however, the sum of their yearly output amounted only to a little more than 3,000,000 roubles. In 1870 the output of these factories, the number of which had not increased, was 6,000,000, and in 1879, to 7,800,000 roubles. More detailed information on the Russian glass works and a complete register with names and details may be found in a beautiful book, by Lobmeyr, entitled «Die Glassindustrie, ihre Geschichte und Statistic. Spemann, 1874», (The Glass Industry, its History and Statistics), originally prepared for the Universal Exposition at Vienna in 1873.

The year 1879 which ended the war with Turkey and which was, in general, a very active year, begins a rapid increase in the works of certain Russian factories. Thus, the totals given by the glass works in 1880, amounted to 8,333,333 roubles; in the next year their combined output increased about 1,500,000, as in 1881 according to official figures, the Russian glass trade was valued at 9,884,000 roubles, the total number of works being a little larger than before.

The movement of the Russian glass industry, during 1883 and 1884, may be shown as follows:

|                                     | In 1883.           | In 1884.            |
|-------------------------------------|--------------------|---------------------|
| Number of works {                   |                    |                     |
| In European Russia . . . . .        | 196                | 206                 |
| In Poland . . . . .                 | 34                 | 30                  |
| Number of workmen . . . . .         | 18,140             | 20,919              |
| Total value of the output . . . . . | 10,236,000 roubles | 10,310,000 roubles. |

During that active period of glass trade, which began at the end of the seventies, the production of sheet or window glass was much developed and perfected. From that time the Belgian method was introduced, as also that of cut glass, and especially, of cut crystal. The activity of the Maltsev factories increased to its greatest extent, as also the output of the Moscow Crystal Works, which formerly belonged to K. Marten, now owned by Duftois, and that in coloured lamps, of the Tver works of Bolotin, in the district of Vyshni-Volochok. The latter has retained the technical traditions of the former celebrated Krougovsk factory, which belonged to prince Menshikov, and was situated in the government of Moscow, district of Klin. In the government of Vladimir, besides crystal and sheet glass, the ancient manufacture of artistic bottles by Kosterev Brothers, and in the environs of St. Petersburg, that of crystal by P. N. Zinoviev rapidly developed. Round about St. Petersburg and, in general, in the northern central region, the production of sheet glass increased and improved in quality, as well as that of service glass, plain and figured. In the west, in Poland, a certain Gordlichka extended his crystal works; factories for making services, bottles, lamp chimneys and shades, were organized and enlarged. Gas furnaces were now used in a much greater number than before, and mostly with regenerators; those of the type of Boezi and Bicheron were not general in Russia. For sheet glass mostly Belgian furnaces of Bieuvé were used, and for bottle making, gas



cisterns, acting continuously. Thus, the rapid advance of the glass industry was not only remarked for the increased quantity of its output, but also for its employment of perfected apparatus and methods, which had a great influence upon the growth and quality of the manufactures.

The following data show the present state of the glass industry in Russia, namely its movement during recent years, from the beginning of the past decade until 1890, as also the output in the different regions:

#### IN 1889.

The total number of glass works in the Empire was 258, in which 23,225 workmen were employed, of which 18,326 were men, 1,681 women, and 3,218 children. The laws concerning young workmen vary for different glass works. Here the necessity of bringing up hereditary workmen, by handing down the work from father to son, is taken into consideration.

For polishing and for other work there were in all 116 machines, the indicative power of which was 1,073; of these 46 were water motors, and 70 steam engines, with 72 steam boilers. The yearly production amounted to 11,146,000 roubles.

#### IN 1890.

The number of factories and of workmen remaining the same, and the total power of the motors having somewhat increased, the total production amounted to the sum of 11,479,000 roubles.

The output of the separate principal regions is represented in the following figures.

| GOVERNMENTS OF EUROPEAN<br>RUSSIA. | PRODUCTION IN THOUSANDS<br>OF ROUBLES. |          |
|------------------------------------|--|----------|
|                                    | In 1889.                               | In 1890. |
| Vladimir . . . . .                 | 1,634                                  | 1,778    |
| St. Petersburg. . . . .            | 1,393                                  | 1,311    |
| Orel . . . . .                     | 1,413                                  | 1,010    |
| Tver . . . . .                     | 643                                    | 759      |
| Novgorod. . . . .                  | 722                                    | 867      |
| Smolensk . . . . .                 | 596                                    | 488      |
| Riazan . . . . .                   | 535                                    | 565      |
| Moscow . . . . .                   | 386                                    | 489      |
| Livonia. . . . .                   | 370                                    | 371      |
| Viatka . . . . .                   | 201                                    | 239      |
| Volyn . . . . .                    | 198                                    | 236      |
| Vitebsk. . . . .                   | 80                                     | 151      |
| Penza . . . . .                    | 112                                    | 126      |
| Kazan . . . . .                    | 92                                     | 111      |
| Nizhni-Novgorod . . . . .          | 119                                    | 132      |

Next come the governments of Kiev and Simbirsk, the total output of each amounting to 90,000 roubles; of Astrakhan, to 80,000, this government having only one factory, producing only lamp chimneys, bottles and apothecary wares, founded in 1887; of Perm, about 80,000; of Ekaterinoslav, 72,000; of Moghilev and Vilno, 60,000 roubles each.

| All the governments together produced: | In 1889.           | In 1890.            |
|--|--------------------|---------------------|
| European Russia . . . . .              | 9,361,000 roubles  | 9,618,000 roubles.  |
| Poland . . . . .                       | 1,455,000 »        | 1,601,000 »         |
| Caucasus, government of Tiflis . .     | 60,000 »           | 64,000 »            |
| Siberia, in the five governments. .    | 210,000 »          | 187,000 »           |
| Turkestan, region of Samarkand. .      | 60,000 »           | 9,000 »             |
| Total . .                              | 11,146,000 roubles | 11,479,000 roubles. |

According to the different sorts of goods, the output of the Russian glass works is distributed in the following manner:

| Articles.  | In 1889:             |                    |
|--|----------------------|--------------------|
|  | Number of factories. | Cost of goods.     |
| Glass for services (hohlglas, gobeleterie). . . . .                  | 57                   | 2,608,000 roubles. |
| Window or sheet glass (tafelglass, verre à vitre) . . . . .          | 104                  | 2,952,000 »        |
| Lamps and lamp chimneys . . . . .                                    | 32                   | 670,000 »          |
| Bottles . . . . .  | 98                   | 2,066,400 »        |
| Looking-glasses and plate glass . .                                  | 11                   | 1,047,300 »        |
| Other glass articles not mentioned in the foregoing rubric . . . . . | 61                   | 1,801,400 »        |

There are only three factories where plate glass is made by melting, the total output of which amounts to 500,000 roubles; the other 8, mentioned in the above table, only make plate and looking-glasses.

As to materials used for making glass alloys, the Russian industry has no special methods worthy of mention, except the using of natural Glauber salt of Siberian lakes, in some works of Asiatic Russia, and of natural sulphate in the Caucasus, in a glass factory in the government of Tiflis, as explained in Chapter XIII, and also in the volume on the Mining Industries. In European Russia fabricated sulphate is used for natrium glass. It is imported, and to some extent, prepared by Russian chemical works and is known under the name of *ogarak* or *arkan*. Also local soda is used for natrium glass, as may be seen in the article on Chemical Industry, Chapter XIII, this volume.

The using of potash for service glass of high quality is greatly developed. Fire clay for pots and stoves is partly imported, but is also to be had at home in great variety, and generally of good quality. The supplying of factories with their principal material, fuel, is of the greatest interest. In this respect the Russian

factories are highly favoured. The vast wooded regions in the vicinity of the manufactories, owing to the Governmental control over the forests, have not been extravagantly laid waste, and industrial works now profit by wood fuel in great abundance, although it has grown rather dear of late. Nevertheless, the principal factories, those which control the industry in Russia, generally use gas-generating ovens, which burn wood and are always with regenerators, the object being not to cut down too many trees, but to use as far as possible waste wood, such as dead limbs and trunks, and fallen timber. This waste fuel is sometimes very abundant, and the gathering of it forms an important industry in some virgin forests. Thus, in those of Novgorod, Tver and Orel, regenerative gas ovens for melting glass, and gas furnaces for burning sand may be seen. The cutting down of the trees is, for the greater part of the factories, in close connection with the lumber industry, as only the tops of the trees, felled by the forest owners for building, serve as fuel for factories.

The substitution of coal for wood first occurred in the western governments of Poland, and in the far south, in the region of the Donets coal veins, including the glass works of the Don, and of the governments of Ekaterinoslav and Kherson, as also to some extent near the capitals, in the governments of Moscow and St. Petersburg. The glass works in the far south were principally constructed for the manufacture of wine bottles, for champagne and sparkling waters. Moreover the Moscow factories use a great deal of naphtha residues. In Astrakhan, where the glass works produce bottles, lamp glasses, and apothecary wares, the Baku naphtha serves as the principal fuel. In Samarkand the gas furnaces of the Ivanov factories, where principally bottles and lamps are made, consume pit coal. In the Tiflis works, producing bottles and lamps, gas ovens work by wood generators.

The total consumption of fuel by the 255 Russian glass works in 1890 was as follows: wood, 250,300 cubic sages, or 2,431,000 cubic metres; pit coal, 2,407,100 pounds, or 39,461 metric tons; naphtha residues, 396,660 pounds, or 6,502 metric tons. Moreover, a small quantity of turf, about 650,000 pounds, or 10,656 metric tons, must be added hereto. This turf is used in one of Maltsev works in the government of Vladimir, and to some extent in Poland.

The prices of fuel, varying in different localities, are on the average: for wood, 4 to 7 roubles per cubic sagene, being 2 to 3 kopecks per pound, or according to the average rate of exchange, 3 to 4 shillings per ton; for pit coal, 10 to 14 kopecks per pound, or 14 to 19 shillings per ton; for naphtha or naphtha residues, in the lower parts of the Volga, 5 to 8 kopecks, or 7 to 11 shillings per ton.

The quantity of wood, consumed by the Russian glass works per unit of weight of glass merchandise, forms on the average of all the factories, 10 to 12 parts per 1 part of goods. Here the total consumption of fuel, including the heating of the building and of the steam kettles, is taken into consideration. The largest quantity of fuel is used for the production of sheet glass. Factories producing such glass in common ovens consume the most: thus, for one part of glass, 15 parts of wood are used, including the total consumption. Those which work with gas furnaces consume 11 to 12 parts of wood per 1 part of glass; thus for example, they employ 0.6 to 0.7 cubic sages of wood per box containing 13 pounds of glass. By examining the consumption of fuel for one melting of glass in furnaces, together with the finishing of the batch, it will be found that on the average of the Russian factories the quantity

of fuel consumed is a little greater than the ordinary technical standard, 7 to 8 parts of wood to 1 part glass. This is influenced by the duration of the finishing of the glass, which shows a little irregularity in some of the smaller works, especially in the western region.

The prices of chemical materials used for manufacturing glass, except sand and potash, are higher than abroad, as they are mostly imported. The soda costs on the spot 1.30 to 1.80 roubles per pound; Russian sulphate, 60 to 75, and foreign, 70 to 90 kopecks per pound. The average price, in the different localities, of Russian potash for crystal factories is 2 roubles, and the so-called Warsaw potash, 3 to 3.60 roubles per pound. Potash prepared from ash on the spot, as in some works, costs about 1 rouble per pound. Sand for crystal, brought from a distance, ranges from 7 to 15 kopecks per pound. Some add to common sand Norwegian and Finnish quartz, and pay for it, according to the distance of transport, 25 to 55 kopecks per pound; chalk and lime, from 2 to 30 kopecks; and sodium nitrate, from 2 to 2.50 roubles per pound.

The number of changes in the melting of glass varies in a given time in factories producing sheet glass, and in those which make service glass. These changes occur in Russian sheet glass works fourteen to eighteen times, and in service glass works, twenty to twenty-five times a month. In all good crystal works, each step in the process does not continue more than twenty-four hours, of which the melting occupies ten to twelve hours, and the finishing of the glass, eight to ten hours, no work being done on Sundays. Sometimes the melting of coloured lamp masses, together with the finishing them off, continues only sixteen hours. In the sheet glass industry very often no holidays are taken into consideration, so that the men work 340 days, the number of batches not exceeding 220 a year. Besides the regular working ovens there is always one in reserve in case of need, and therefore the work is seldom stopped.

The class of workmen known as glassblowers was established in Russia long ago; among them there are, as well as in other countries, real artists. The wages they receive are the same as those paid in Bohemia, where a chief workman, *glassmacher-meister*, together with his two helpers and one boy, *lehrlingsbursche*, receives from sixty to one hundred guildens a month, out of which he himself pays his helpers. In the Russian crystal industry a workman, with his two helpers, receives for the making of common tumblers, which have about 250 cubic centimetres capacity and weigh from seven and one-half to eight pounds per thousand and of which the three workmen together can make 700 pieces during eight hours, 50 kopecks per hundred of simple tumblers, 60 kopecks for the first sort and 45 kopecks for the third; consequently from 3.50 to 4.20 roubles for one change of work, or from 80 to 100 roubles monthly. For the making of glasses each work-table, or set of workmen, consists of two chiefs, one helper and several boys; the latter receive their pay independently. The press workmen receive less, namely 40 to 45 kopecks per hundred. In the glass industry the total pay to a set of workmen, consisting of blowers with their helpers, pressers, drawers and others, forms 40 to 60 per cent of the total cost of the manufacture.

In the production of sheet crown glass, the number of batches being 14 to 18 per month, and in those by the Belgian method, the press workmen receive their pay per sheet of glass. A certain number of these sheets form a so-called *bunt*, an old

German measure till now used in Russia for calculating the pay due to workmen, and also in selling window glasses. A work-table consisting of two workmen, who make from five to six cylinders of glass per hour, or at least forty per day, summer and winter, receive from 25 to 30 kopecks per bunt, containing two cylinders of 24 vershocks, or 1.067 metres long, and 9 vershocks, or 400 mm. in diameter each, making five to six roubles per day; or, if there are 15 to 16 such works per month, 75 to 100 roubles monthly. When the cylinders are smaller the pay is also lower. In the sheet glass industry the total wages to workmen forms one-third of the total cost of the manufacture.

The cost of labour in the bottle industry is also from 30 to 35 per cent of the total expense of the production. The number of batches per month in that branch of the glass industry is 17 to 20, if the work is done in pots. In so-called interruptive cisterns without pots, the number is about eighteen or nineteen. In such cisterns as use gas, the melting of the glass and the finishing the work off is done in turns as in ordinary furnaces with pots. The bottles are made exclusively in forms. The melting of glass for bottles in ordinary ovens continues seven hours, sometimes only six, and one hour is given to the workmen for rest. During these six or seven hours a workman makes 350, and some even 400 bottles. In the interruptive cisterns, of ordinary capacity, 9,000 bottles can be made in 12 hours. The work-table consists of three persons: chief workman, his helper sometimes called jar-maker, and a boy. When the work is done in ordinary ovens it is organized otherwise: near each pot, four sets of workmen are stationed, each set consisting of three labourers.

The capacity of the pots used in Russia for melting glass, is as follows: For crystal, and in general for service glass, they contain twenty, seldom twenty-five pounds, or 325 to 400 kilograms of melted glass. The goods made from this quantity of glass weigh from 13 to 16 pounds. In the sheet glass production, dependent upon the size of the works, the capacity of the pots is 20 to 75 pounds. In the latter case the filling of the pot is by degrees, in ten additions, until the pot is full of melted glass, in proportion as the melting material, becoming liquid, sinks. For a pot of such large capacity there are three chief workmen at a time, each having four substitutes. When cylinders of middle size are produced, each workman makes on an average ten per hour, and the whole batch continues eight to nine hours. An oven which has ten pots of 70 pounds capacity each, produces yearly about 5,000 boxes of window glass the number of batches being 15 per month. There are plants containing two such ovens, with one in reserve for emergencies. In the bottle factories the pots are of 30 to 40 pounds capacity, each oven containing 8 to 10. Pots of small capacity, 12 to 17 pounds, are used for melting glass for coloured lamp chimneys and shades, and for special chemical wares. For making plate glass, round pots of 40 pounds capacity and of a flattened form, having a diameter of one and one-half arshines, or 1.066 metres, are used. In the looking-glass works, in the Riazan government, three gas ovens of Siemens pattern, each having 12 of such pots and 24 stoves for hardening the glass, have been working until now.

Service articles in glass are sold in Russia by the piece; sheet glass, in boxes or half-boxes. A box of sheet glass, generally consisting of 20 bunts, averages from six to several hundred pieces of glass of equal size, depending upon the number of

sheets in a pack, as established by the manufacturers in their price lists. The selling price of sheets is not determined by their size, a factor taken into consideration only when the price of the packets which form a box is fixed. For a clearer idea of the prices of glass wares the following figures are given, showing the average market values of a weight unit of such goods without delivery.

Crystal of good quality, in plain, cut, and pressed articles, costs in Russian factories, 9 roubles per pound. For wholesale buyers a discount of 25 per cent is made per barrel. A barrel of crystal costs from 65 to 70 roubles, and contains seven and one-half pounds. Plain services, or figured, of good clear glass of medium quality is sold on the market by the manufacturer at a profit ranging from 2 to 5 roubles per pound.

There are in Russia, although in very small quantities, services made of plain crystal without any designs; they are an imitation of the service glasses of celebrated foreign makes, and are called *Baccarat*, in honour of the renowned French crystal. They are very much like the French leaden crystal as to purity of finishing and form. However, they are made of more practical potash crystal, and only occasionally do they have some lead in their composition. The prices of such services, manufactured only in recent years by one of the factories of Maltsev, average for small and larger objects, 25 to 26 roubles per pound. Thus, for example, large tumblers, which are the cheapest representations of this class of goods, cost 19 to 20 roubles per pound; small tumblers, 24 roubles; and small wine glasses, 31 to 36 roubles per pound. Such services are sold largely in the capitals.

The average price of window glass of high quality, white Bohemian of prime sort, a box of which costs 45 to 50 roubles, averages from 3 to 4 roubles per pound; grayish window glass, fifty per cent less. Ordinary sorts of bottles of pure manufacture cost from 1 to 1.50 roubles per pound. Better sorts of wine bottles cost from 2 to 2.50 roubles per pound; such goods are sold by the hundred, or by the thousand pieces per pound. In Asiatic Russia, where the manufacture of bottles is quite unequal to the demand, the commonest makes were sold recently at 15 roubles per hundred. Such a price is very high, as in European Russia the same sorts can be bought at 3 to 4 roubles per hundred.

The trade in looking-glasses in Russia is much embarrassed by the import of foreign mirrors. These goods, made in Russian factories, are generally of small dimensions, often about one square metre, as the demands for such glasses on the home markets are 5 or 6 times those for large sizes, as explained by the fact that the principal markets try always to supply the wants of the middle classes.

Russian factories, however, produce conformably to their technical means large sizes also, the largest being 6 square metres, as well as the small and medium size mirrors. Plate glass used for windows and doors, as also very thick glass for roofs, is to some extent made at Russian works, such as Amelung and Smolianinov, and in part, imported. Large looking-glasses are also brought into St. Petersburg, very often in the unpolished state, and are then finished off in the local factories.

Plate glass is sold at 2 to 3 kopecks per square vershock, or 10 to 15 roubles per square metre. The trade in small glasses, owing to the low prices of those imported, brings but little profit to the producers. Large looking-glasses, however, are more profitable, as they sell at 6 to 7 kopecks per square vershock, or 30 to 35

roubles, which makes, according to the rate of exchange, 112 to 130 francs per square metre.

The transport of glass goods to the interior of Russia is as far as possible by water; thus, the goods from the group of the Maltsev factories go to the south by the Desna and the Dnieper, and to the east, as far as Nizhni-Novgorod, by the Oka, which passes through Oriol, and rises near the government of Kursk. The other central group of Maltsev factories is still closer connected with the market of Nizhni-Novgorod. Part of the goods transported thence go into Asia, either by the Volga towards the south, or towards Viatka. For that purpose special kinds of goods are prepared, called Asiatic, which consist of many kinds of coloured glass. From the above centres, glass is also transported by rail. The Maltsev factories, of the Oriol group, have their own small railroads, the length of which, including all the branches to the different works of Maltsev, is about 200 versts. Some factories of the western Polish provinces, situated near the principal railways, also have their own private lines.

Goods from the north-central group, the trade centres of which are Moscow and St. Petersburg, and those from the western group parallel to the trade roads which move foreign goods imported over the Russo-Austrian frontier, are carried all the year round by rail. Thus, the principal quantity of glass goods is transported even during summer by railway.

The yearly export of Russian glass by the Asiatic frontier has averaged in late years, from 100 to 200 thousand roubles annually. Some articles are also exported into Western Europe, especially to Germany, and according to official data such export ranges from 200 to 250 thousand roubles a year.

The import of glass goods is very considerable, and has been estimated during recent years, from one-tenth to one-eighth of the total value of the Russian production. The exporting countries are Austria, France, Germany, Belgium and England. The principal and most valuable articles imported are leaden crystal, Bohemian service glass, window glass of large dimensions, and looking-glass.

The following figures show the value of the articles imported over the European frontier:

| Years.         | Paper roubles. |
|----------------|----------------|
| 1886 . . . . . | 2,390,000      |
| 1887 . . . . . | 1,720,000      |
| 1888 . . . . . | 1,300,000      |
| 1889 . . . . . | 1,740,000      |
| 1890 . . . . . | 1,590,000      |
| 1891 . . . . . | 1,520,000      |
| 1892 . . . . . | 0,900,000      |

Estimated according to their trade importance in the capitals, the first place among the objects of import is occupied by plain service glass, not faceted, and by moulded service glass, *verre moulé*, produced by French factories, especially by Baccarat. In St. Petersburg simple service glass costs 12 to 13 roubles gold per pound, containing from 30 to 200 pieces; and moulded, 8 to 12 roubles gold per pound, containing 20 to 120 pieces. This price does not include the customs duties, which are for

plain, 4 roubles, and for moulded, 2 roubles gold per poud; such are leaden glass goods, heavy and strong. Belgian plain half-crystal, such as Val St. Lambert, are also much imported; they cost in St. Petersburg, not including duties, 4 to 9 roubles gold per poud, each containing 80 to 280 pieces. French leaden glass, as well as the Bohemian plain and faceted, which is a little cheaper than the French, is much admired in both capitals; large tumblers cost 6 to 7, and small wine glasses, 10 to 14 roubles gold per poud. Foreign coloured and decorated glass is in much less demand than the plain white. Bohemian crystal of cheap facet is also much imported. The faceting industry in Bohemia is, since ancient times, divided into many branches.

The next article of trade importance is the Belgian plate glass of large dimensions, as also Belgian and French looking-glasses. Window glass costs, according to the size, from 3 to 8 roubles per poud; a looking-glass of medium size, as is generally the Belgian of second quality, is priced at 5 to 6 roubles gold per square metre, not including the duty. The tax on looking-glasses in general is high, and depends on the dimensions of the surface. Thus, when the size of the looking-glass is 1 square metre, the duty is 10 roubles per square metre; if it is two square metres, the duty is 13 roubles gold, and further in like ratio. In the same way the duty on ordinary sheet glass, when the surface is less than 1 square metre, is 1.50 roubles, and exceeding these dimensions, 3 roubles per poud.

By comparing the data showing the cost of the home glass industry with those which give the value of the import, it will be seen that the yearly consumption of glass in Russia amounts to the sum of the two totals, which ranged in 1889 to 1891, from 13 to 14 million roubles a year.





## CHAPTER XII.

## Ceramics.

**T**HE making of pottery forms from time immemorial one of the most widely spread branches of industry in Russia. The number of potters and grinders possessing special knowledge and able to answer the highest requirements was always great, the pottery trade being one of the household industries, thus not only facilitating the large factories but furnishing also one of the principal motives for their establishment. The variety of articles produced at the household workshops enabled the local potters to be always ready to help the manufacturers in every branch of ceramics. Thus, for instance, when with the development of the chemical products, especially with that of muriatic acid, the demands for special pottery arose, the establishment of the proper works presented no difficulties, having already a practical foundation to work upon. All the conditions and qualities which can be exacted in the ceramic art were united in this branch of the pottery trade. The success of the production depends on many conditions, namely: the mass must be of uniform structure; the finish must be carefully done by hand; the resistance of the material to mechanical force must be considerable; the material must be fine grained, as if fused; it must be proof to change of temperature and strongly baked; the sides of the pots must be comparatively thin, although to a considerable extent they must be fireproof, and the dimensions must be very large. The workmen for the manufactory were chosen among the best potters engaged in the household industry, and they proved to be quite prepared to perform all work set before them.

In such way, for example, the production of stoneware for chemical use was established at the large chemical factory of A. A. Shlippe in the village Plessenskoe in the Vereisk district of the Moscow government, founded in 1825 by K. K. Shlippe, renowned for his chemical investigations. The works for the manufacture of stoneware used at the chemical factory were established there in 1862. In 1890 this factory gave way to other Moscow chemical manufactories, and the firm closed its doors. Another more recent example is represented by the great chemical factory of P. K. Oushkov in Elabounga, government of Viatka, where stonewares are also made.

It must be mentioned that the production of stoneware is by no means less

complicated than that of the white porcelain. In the pottery trade, as has already been the case in many other branches of technical production in Russia, the household industry served as a basis upon which separate manufacturing centres of crockery, earthenware and porcelain were comparatively recently established. The hands employed at such factories were generally the local household workmen. It should be mentioned also that the founders and owners of such establishments, centralizing the trade, came mainly from the midst of the workmen engaged in the household work; therefore, it can be said that the merit of the organization of the earthenware and porcelain manufacture must be wholly attributed to the household industry. Thus, the ordinary pottery trade in Russia claims attention not only as a branch of popular occupation, but also with regard to its connection with the ceramic works established in Russia. Special statistical investigations and works have always been consecrated, and especially in recent years, to the popular manufacturing industry. The photographs exhibited by Mr. Ergemsky at the World's Columbian Exposition at Chicago show in very great variety the samples of the national Russian pottery, they being gathered from different large collections, such for instance as the Museum of Wares of Household Industry in St. Petersburg.

The so-called *Gzhel*, a locality situated in the Moscow government and comprising a group of villages of the Bronnitsk and Bogorodsk districts, as well as some villages of the district of Pokrovsk, government of Vladimir, was renowned of old for the favourable conditions it presented to the development of household pottery. The village Gzhel with the adjoining villages is situated 50 versts distant from Moscow in the centre of the locality having a vast area of clay repositories, known by the general name of the gzhelsk. Here the making of pottery served as a means to enrich clever peasant enterprisers; this locality is rich not only in excellent potter's clay but also in some kinds of light fire clay, good for the manufacture of the average sorts of earthenware and porcelain, for fireproof bricks and moulds.

The white clay (china clay) of the best quality, for the needs of the manufacturer, was brought here from the Chernigov government, namely, from the district of Gloukhov, vastly renowned in Russia for its different sorts of *kaolin*. However, Gzhel itself is rich in fireproof china clay found in the villages Minin, Zhirov, Bechitsy and others. The development of the pottery trade in this region, in the hands of separate enterprisers, ran the following course: having put aside about a hundred roubles, a peasant of Gzhel engaged 2 or 3 workmen and began the making of bricks, the local clays being practically fireproof, and occasionally that of plates, the latter being chiefly manufactured at the household establishments grown to be regular factories. As the trade went on well the making of moulds for baking earthenware and porcelain was established in a separate building, the products being sold to the manufacturers. Thereupon, under favourable conditions, his establishment was soon turned into a regular factory for the making of plates.

This abundance in ceramic materials, united to the good position of the locality with regard to the ways of trade communication with Moscow, with the east through Kazan, and with the southern markets of Kharkhov and Poltava, called forth a strong development of the household industry in Gzhel. The object of the trade in later years, especially in the beginning of this century, was the production of earthen

and porcelain plates, which gained the preponderancy over other specialities of the ceramic trade, such as the making of pipes, melting pots, pots, jugs and moulds for sugar loaves, which were formerly in use. The general character of the earthenware and porcelain trade, developed here in this Russian Staffordshire in the hands of household workmen, depended firstly on the fact that it answered to the needs of the people in general, having like the other branches of the industry in view first the cheapness and practicability of the wares. Plates of the so-called semi-earth, made of local clay in Gzhel itself and glazed with lead, were sold at 30 to 35 kopecks per dozen, and the quality was not bad. To order, such good porcelain wares were so well produced, as for example, at the establishment in the village Rechitsy, that the middlemen, buying them from the peasant makers in Gzhel, sold them as foreign goods, which according to the custom of the times raised their value.

The great production of plates at the factories in Gzhel was followed by the establishment of the painting industry concentrated in special workshops. The manufactories gave the plates to these shops to be painted, the payment therefor being by the piece. Special workshops for preparing paints, used in the muffle painting on porcelain, were also organized. Both of these kinds of workshops, forming branches of the regular factories were founded and managed as those by the peasant workmen, a fact showing plainly with what knowledge and how steadily the trade was organized in this locality. Gzhel is the birth place of ceramics in Russia, but it lost much of its importance with the settling of the industry near large manufacturing centres established in different localities of Russia.

The household production of pottery was in the most flourishing condition at the period from 1830 to 1860; the immense factories of earthenware and porcelain belonging to M. S. Kousnetsov owe their prosperity to the Gzhel, in which this firm has been for many years one of the most important.

The production of *white plates* in Gzhel dates from the latter century and the Moscow porcelain factory of Gardner had undoubtedly a favourable influence upon its development, although there are other data showing that, just at the time when Gardner's factory was founded, porcelain clay had been brought to Gzhel from Gloukhov, government of Chernigov as described in *Materials of Household Industry*, by Meschersky and Modzalevsky, St. Petersburg, 1874.

The decline of the household industry towards 1860 was in a certain degree due to the raising of the prices of fuel in the locality to an extent that made it impossible for the kustars to continue the production of cheap wares with a profit. Thus, in the beginning of this period when all the trades of Russia tended to development and the general activity with regard to large manufacturing undertakings was noticeable, the household industry, centred in Gzhel owing to circumstances, in the hands of its most powerful representatives gave birth to vast manufactories in different towns of Russia. However, the production still continues in the locality of Gzhel in the form of a household industry, having some importance with regard to the making of plates as well as to that of bricks and pipes. The clays of the Gzhel also furnish the necessary material for making pipes, bricks, paving plates and tiles to some of the factories situated in Moscow vicinity; for example, to the large brick and pottery manufactory of the architect S. E. Ovannesianz, formerly that of N. B. Stepanov, 30 versts distant from Moscow.

Besides this typical locality, in which the ancient popular industry promoted the organization of the great pottery concerns of the present day, attention is drawn to the governments of Yaroslav and Tver, especially to the district of Vyshni-Volochek, in the latter district a town of the same name is situated on the railway between Moscow and St. Petersburg; some of the districts of the government of Novgorod, especially the district of Borovichi, the town being a little to the east of the same railway and united to it by a lateral branch, should also be mentioned. Both of these neighbouring localities are situated on the slopes of the Valdaï mountain chain, but the quality of their clays, as well as of their production, bears a somewhat different character. The blue, gray, and red clays of the government of Tver are excellent kinds of potter's clay; the gray, white and black clays of the district of Borovichi belong to the best fireproof clays of Russia, in general, and to the best kinds of the clays of the Novgorod government, rich in fire clays. In both these governments the making of pottery is largely developed, the government of Novgorod having special importance, furnishing its fire clay to different Russian manufactories, and producing fire bricks on a large scale.

The history of the development of the trade here is much like that of Gzhel, the household industry serving as a basis for large manufacturing centres, and influencing later on the methods of the household producers. One of the most interesting episodes of such historical development was the establishing of the works of N. A. Gouzhov in the locality situated on the verge of three districts, the Vyshnevolotsk and the Vessiegonsk of the government of Tver, and the Borovichsk, government of Novgorod. The painted pottery, decorated with gold, of this manufactory is renowned; this concern became later the property of S. J. Maslennikov, and it was here that this intelligent leader organized the production of the first majolica wares in Russia. Majolica, mainly the English, made by Minton (H. Minton & Co., Stoke on Trent, Staffordshire), has been long an object of import into Russia, although to no great extent, together with the porcelain made on the continent, as also the English faïence, the latter serving as a model; after long efforts and investigations the making of majolica was established at the manufactory of Maslennikov. A piece of land 20 versts distant from the factory where white clay was discovered resembling that of Borovichi in quality and appearance, was bought for the purpose; some other clays were brought from the government of Novgorod, as the Demiansk and the Tikhvinak; and the Gloukhovsk clay of the Chernigov government was added for the manufacture of the finest sorts. Besides clay, other materials were used for the manufacture, such as sand, brought from a distance of 40 versts; feldspar and quartz brought from St. Petersburg; and stone found on the spot, namely, that forming the hills of the Vyshnevolotsk range.

The body of workmen chosen from those of the factory and from local potters included some tens of pupils, learning at the establishment itself practically the making of majolica; at the end of the year the more capable of them were selected. In like manner, painters and so-called sculptors were prepared from peasant youths under the direction of the chief foreman sculptor, who had served in the factory before it was owned by Maslennikov. Majolica wares were as usual made by different methods; the form was either given by turning on lathes, or by stamping, but forms of plaster of Paris were mainly used for that purpose. In the

hall assigned to that kind of work 40 machines were established. Enamels (coloured glazes) were prepared in a separate building under the direction of a special foreman Basil Iv. Zhoukov; the number of their shades was over 200.

The manufactory produced among other wares enamelled majolica, Dutch tiles, and painted plates for ikonostases and exterior facings. Instances of such goods are shewn by the church, built by the architect Lion on the estate of Mrs. Petrovo-Solovovo in the Kirsanovsk district, the facing of which is all made of majolica ornaments; the ikonostas in a church of the district of Kashira; the window arches in the chapel of St. Panteleimon in Moscow, some parts of the Barbara chapel in Moscow, and others. The majolica manufactured by Maslennikov found ready markets toward the eighties in Moscow and St. Petersburg; in later years this special kind of work, remaining under the former management of S. J. Maslennikov, was joined to the vast manufactories of M. S. Kousnetsov. It should be mentioned that wares very much like majolica, made of light or reddish clays and enamelled with very bright coloured glazes, form a favourite branch of household industry in many localities; it often occurs that such wares, notwithstanding their cheapness, do not lack a certain amount of artistic taste, and serve ornamental purposes. Thus, in southern Russia, the peasants of Little Russia, of the Kharkov and Poltava governments, are manufacturing majolica uni-coloured and multi-coloured, for example, the peasant Padalka, Lebedinsk district, government of Kharkov, produces green majolica, and Roman Kouscha and Pavel Kalashnik produce majolica out of the clays of the Zenkovsk district of the government of Poltava.

The production of ornamental coloured tiles and mosaic ceramic plates for facing had in different times estimable representatives among the manufacturers, who learned the art at the Stroganovs drawing-school in Moscow, founded by V. J. Bontovsky. and having a special division for muffle painting on porcelain, faience, and tiles, with a separate furnace situated in the Polytechnic Museum. Some of the leading manufacturers were engaged in the production; so for example, Gousarev in Moscow was renowned for his terra-cotta wares made of red clay; A. J. Yagn, at whose factory in the village Voronki, in the Koseletsk district of the Chernigov government, peasant boys of 15 to 19 years did the work, and where the *mezhygorsk* kaolin of Kiev was used in the manufacture; the highest degree of artistic work was attained by Bonafede together with the academician Monighetti, and by the architect Kharlamov in St. Petersburg, as well as by some others. Nevertheless, the special development of the manufactory of S. J. Maslennikov, which arose by means of the gradual changes undergone by the simplest branches of the ceramic art, must be reckoned as one of the most important moments of the establishment of majolica manufacture in Russia; the further progress of this industry, seeing its character, depends only upon the measure of artistical taste and labour applied to it. This factory is situated in the village Chermiatka, 30 versts distant from the station Troïtsa of the Rybinsk-Bologoe Railway; the production of majolica forms now a part of the business of M. S. Kousnetsov, and this factory is owned by Dr Bielina, who has introduced another speciality, namely, the production of drain pipes.

Returning to the ceramic industry in the government of Tver, it should be mentioned that one of its localities, namely the Korchevsk district, nearest to the Moscow government, was one of the first centres of the manufacture of the highest

sorts of faïence in Russia. The first factory for the making of faïence plates was built in this district on the land owned by Golovachov; it had been established in 1809 by the apothecary Brunner, the potter Kobotsky, a turner of Gardener's manufactory, and by Reiner, a compounder of the mass at the same factory; the production went on for some years, when the works were sold to A. J. Auerbach of Lithuania. Auerbach moved shortly the plant to another place in the same district, namely, the village Kousnetsovo, where he developed its activity, which had a first rate importance in the history of the manufacture of Russian faïence. Auerbach was the first to produce faïence plates of a very high quality approaching that of the English makes, and he sold it at comparatively low prices: the plates made by Auerbach served as a model for other establishments, chiefly organized at the already existing porcelain factories. Persons interested in ceramics are aware that, although the making of porcelain has its specific difficulties, the producing of faïence is more difficult still, especially with regard to the compounding of the mass used in the highest sorts, for example, fine faïence, ironstone and earthenware. The manufacture of faïence appears to be more easy and simple than that of porcelain, because the latter has not so many steps in the process, which are noticeable in the production of faïence, under the name of which so many different sorts are collected, descending to the cheapest, namely, the semi-earthen wares. In fact, the difficulty experienced by the Russian factories, especially by those newly established, in imitating the best sorts of English faïence, for the production of which England is of old famous, in as much as the continent is celebrated for the production of hard porcelain, illustrates the above statement.

One of the first followers of Auerbach in the making of faïence in Russia was A. Sokolov, who founded in 1827 a small factory in Vyshni-Volochek. The production of faïence plates was, in 1832, introduced at the very ancient porcelain factory of Gardener in Moscow, but the work produced there never reached a high degree of quality. Some other factories existed for a short time; for example, the factory of Poskochin near Schlüsselburg, in the government of St. Petersburg; that of Nemart in Louga; later, that of Günter near St. Petersburg; that of Lövstrem in Kögsholm, government of Viborg, afterwards owned by E. N. Artemiev; and some factories in the government of Volyn, justly renowned for their excellent Kaolin; some of these manufactories produced really excellent wares, which however did not become widely known. The general success of the large manufacture of faïence in Russia having regard to the quality of the wares produced, dates only from the beginning of the eighties. The faïence manufactory in the Korchevsk district of the government of Tver was some time ago bought by the celebrated manufacturer M. S. Kousnetsov, who owns it still.

During the seventies the production of faïence in Russia was reinforced by the establishment in Finland of a new manufactory; it was that of *Arabia*, founded in 1873 in Helsingfors by Börstrand, whose workshops were regarded as classical models in Stockholm (Börstrand's Aktiebolag, Stockholm). Later on, that manufactory went over to a Finnish Co. (*Arabia Porslinsfabrik Aktiebolag*). The wares of this factory, of a comparatively good quality and approaching the English makes more closely than the Russian wares of that time, were widely spread over all the Empire, and especially in Moscow, at the end of the seventies and the first half of the eighties.

The markets of the latter region were always ready to buy examples of good quality. The Finnish wares exerted a great influence upon the development of faïence, serving as models and stimulating the home competition, especially in the large manufactories, in which at that period the household industry had centred, and which until then were of the greatest importance to the local markets.

Because of the stringencies of the times, the large manufactories were forced to lower the prices of their wares, and therefore the medium and lower kinds of goods became, of course, predominant; nevertheless, all measures tending to further the improvement of the highest grades of faïence have been employed since the end of the eighties until now, and good results in this specialty have been attained; the best sorts of the Russian faïence, however, made now mainly at the factory in the government of Tver, are not to be compared in quality with those formerly produced. The successes attained in the manufacture of faïence are the latest in point of time which the Russian ceramics have attained in its different branches.

In the government of Novgorod fire clays are very abundant; among them there are kinds which would astonish an amateur by their extraordinary qualities and peculiarities; for example, the so-called *velgheysk* clay found near the rivulet Velgheya, a tributary of the river Msta; the *kovankinsk soukhar* and other so-called *soukhars* of the district of Borovichi, which form no paste with water; and also other varieties.

The *kovankinsk-soukhar*, found on the lands of Mr. Kovanko, contains 41.10 parts aluminium, 38.01 bound and 4.45 free silica, 0.24 lime, 0.09 magnesium, 1.81 peroxide of iron; its loss in firing is 13.97 per cent. These clays, studied and analyzed by Russian as well as foreign specialists, for example, C. Bishof, brought about long ago, on the one hand, as a predominant branch of the ceramical industry, the manufacture of fire bricks and hearthstones, together with a large trade in fire-clay products, and on the other hand, the production of the fireproof plates for household use, able to resist the most various changes of temperature on cast iron hearths; it is a kind of stone plate of very strong coloured faïence, or wedgewood. Moreover, other special branches of ceramics, not dependent on the profusion of the fire clays, have developed in this locality; for example, the making of terra-cotta wares and ornaments at the factory of Zaitsevsky in Borovichi, where stonewares are also produced, as also at the factory of Fok in the district of Tikhvin where this product is a specialty. However, in this locality the first place must be allotted to the production of fireproof building materials, and to the now greatly developed manufacture of water mains, a branch of industry in which the import, chiefly from Sweden, and to some extent, from England and Germany, has until now been very considerable.

The making of fire bricks dates from time immemorial in different localities abounding in deposits of fire clays, in the form of a household industry; in a like manner it has existed in the government of Novgorod, especially in the environs of Borovichi. As an evidence of the preference given in Russia to the English fire bricks, considerably less now than formerly, may be cited the fact that the peasants of the district of Borovichi long ago stamped on the bricks made by them a special mark consisting of a lion and unicorn, as an indispensable attribute of the genuine fireproof bricks. Until now the words «English» and «fireproof» are synonyms when

referring to the quality of bricks; therefore, «English bricks» mean «fireproof bricks» in Russia. Special efforts to further this branch of industry in Russia were made by N. P. Gorizontov and K. Z. Vachter in the district of Borovichi, near the deposits of which many factories are now grouped. The largest establishment of the persons mentioned above is owned by K. Z. Vachter, namely the Zhdansk factory in the village Zhdani, eight versts distant from Borovichi, founded in 1880 on lands leased from Anichkov; the landowner Anichkov was himself formerly engaged in furnishing *borovichsk* fire clay, some sorts of which are until now known under the name of *anichkovsk*, to the manufactories of St. Petersburg. During the first six years of the existence of the business a hard task was set before Mr. Vachter, namely, the competition with English bricks imported duty free; while the sale of the Russian makes, the chief markets being the manufactories of St. Petersburg, was greatly impeded by the cost of the transport thither; the freight for bricks from England, chiefly from New Castle, to St. Petersburg was on the average 6 shillings per ton; and the freight for bricks brought from Borovichi, notwithstanding the short distance, (a little over 300 versts), by water ways not very convenient, or by rail, amounted to 7 and 7 $\frac{1}{2}$  kopecks per pound, which reckoned at the average par exchange is equal to 8.5 to 10 shillings per ton. A considerable impetus to the fire-brick industry in Russia was given in 1886 by the placing of a duty upon such wares, the tax being also somewhat raised by the tariff of 1891, namely, to 4 kopecks in gold per pound.

The production of fireproof wares at the manufactory of K. Z. Vachter had attained a great development about that time; and now it not only comprises the manufacture of all sorts of brick, but that of a series of special articles used at some of the factories, requiring a high temperature as well, for example: massive moulds and abutments used in the building of furnaces, gas retorts, grooved plates for the vaults in muffle furnaces, melting pots, and all kinds of wares known by the name of *shamotny*, that is, fireproof goods. Mr. Vachter, in addition to the above-mentioned factory in the village Zhdani, has recently built a large manufactory near the station of Borovichi. The yearly output of fire brick at these two manufactories amounts now to 5 million pieces, while in 1888 the output was only half that amount. This production of course, as compared to that of the manufactories exporting their goods over all Europe, as for instance, the factories of the Höganas Co. in Sweden, or that of Glenboig in Great Britain, the yearly production of the first ranging from 40 to 50, and that of the second from 70 to 80 million pieces, is only a beginning, made by a private person of great energy and ample means. However, this splendid initiative will undoubtedly serve as a strong basis for the further development of the manufacture of fire bricks in Russia.

The making of drain pipes and of stoneware has greatly developed of late at the same manufactory, owing to the excellent quality of the clays and to the rich supply of technical means furnished in both of these productions. Thus, there are 3 rolling and 3 cylinder presses for the making of drain pipes of the clay mass, which undergoes a series of various processes, such as rolling, grinding, frequent running through kneading machines. and receives as a necessary compound a certain quantity of finely ground fire brick (*shamot*) prepared in special grinding apparatus. For fuel, wood dried very thoroughly in a special wood kiln is used; there are four such furnaces at the manufactory with a general surface of fire grates of



16 metres. The equipment of the manufactory at the present time enables it to produce daily from 400 to 500 pipes, one arshine long, as drain pipes are generally made at Russian factories, and of the usual diameter of 6 to 9 inches; thus, the average production amounts to 120,000 pipes per year. Pipes of small diameters, beginning at 2 inches, are also made, but for them hand presses are used; large pipes are also made, 12 and 18 inches in diameter, and when specially ordered, of 24 inches. The pipes, 6 to 9 inches in diameter, cost at the manufactory itself from 39 to 40 kopecks per pound; brought to St. Petersburg the cost to the manufacturer is 64 to 66 kopecks per pound (one sagene of drain pipes of 6 inches in diameter weighs 3 pounds, and 5 pounds, if the diameter be 9 inches).

To give a better idea of the development of the manufacture of drain pipes in Russia other makes of the locality besides those of K. L. Vachter should be considered, for example: the factory of the engineers, Koliankovsky Brothers, under the title *Nov*, at Borovich, which was founded a little later than that of Vachter, and is specially engaged in the making of drain pipes; at the present time the quantity produced exceeds that of the factory of Vachter by one and a half times; the Russo-American Co., for the making of ceramics, under the title *Nadezhda*, recently established and having as yet but an inconsiderable production of pipes, deserves mention, as well as the Warsaw factory, near the station Praga of the Warsaw-Terespol Line, owned by Grantsov, under the title *Kavenchin* (cegielnia Kawenczyn), which produces ordinary bricks of various forms, as also fire bricks, and drain pipes 2 feet in length and from 4 to 12 inches in diameter; these pipes were used at the recent canalization of Warsaw, together with the imported Silesian pipes; the factory of Ovannesianz, already mentioned, near Moscow, at the station Vassilievo of the Nizhni-Novgorod Railway, is important, producing drain pipes of the *gshelsk* clay, as well as wares of fire clay, such as arches, plates, pipes for gas ovens and steam boilers, fire bricks and pipes for canalization from 4 to 12 inches in diameter; the factory of Baron Bergenheim in Kharkov, founded some six years ago, and the small factory at Ekaterinodar in the Koubausk oblast belonging to the town, and that of the Princess Droutski-Sokolnitski near the station Ostrovets, government of Radom, also deserve notice. All these manufactories produced strong baked trench pipes approximately in the following quantity: in 1892 the manufactory of Vachter, to the sum of 70,000 roubles; the *Nov*, 100,000 roubles; the Warsaw, to 50,000 roubles; that of Bergenheim, to 50,000 roubles; all the others combined, to the sum of 70,000 roubles. Thus, the total production of drain pipes amounts to the sum of about 350,000 roubles; if the drain pipes of all diameters be reckoned at an average price of 60 kopecks per pound, then the production may be estimated at 500,000 pounds, sufficient to lay a yearly drain of 250 versts, if the weight of a sagene of pipes be reckoned on the average at 4 pounds. The import of drain pipes has decreased somewhat of late years; during the year 1891 to 1892, it amounted to 200,000 pounds, which, being reckoned by the same scale of weight, would make it possible to lay an additional drain of 100 versts in length.

As to fire bricks, the demands of the manufacturing industry in Russia, especially of the metallurgical works, are supplied to a considerable extent by home production. This material is prepared from local clays to a large extent by the very manufactories which require it. Recently some of the metallurgical factories began to produce

by their own means the so-called *dinas*, a special kind of quartzite or sandstone fire brick, until then reckoned as the special attribute of some metallurgical works. The production of fire bricks as an article of trade, for the use of the factories and for the aims of architecture, for the building of stoves for example, is as yet but feebly developed, and in very few special centres, the yearly output of which can be fixed approximately at 15 million pieces. The official statistics of the manufacture of bricks do not separate this amount from the general total of bricks, which for all Russia and Siberia in 1892, was reckoned at about 850 million pieces; the largest quantity was furnished by the Moscow government, namely about 140 million pieces, by the St. Petersburg government 73 million, by the government of Kharkov 45 million, by the governments of Kiev and Ekaterinoslav 35 million each, and by the Tauride government and the Don district 26 million each; the governments of Poland gave a general output of 142 million, those of the Caucasus 55 million, Turkestan 6,400,000, and Siberia, according to the published data, only 5 million pieces. The local production of bricks at the metallurgical works for their own use is not included in this number. Some of the smaller and temporary establishments also escape registering.

The figures showing the production of ordinary bricks are of course very small in comparison with those giving the production of the United States of America, and with those of the more prominent manufacturing countries of the Continent. As to the special demands for fire brick, as a ready article of trade, it may be stated for example that the demand of St. Petersburg alone ranges from 8 to 9 million pieces annually; the yearly demands of Moscow and other chief manufacturing towns can be fixed at 16 to 20 million pieces; thus the annual requirements of fire brick, partly satisfied by the home production and partly by imported goods, may be given at 25 to 27 million pieces.

The import of fire brick chiefly from the manufactories of Great Britain, Germany and Sweden, has averaged of late years from 10 to 12 million pieces yearly. Thus, between 1886 and 1890, 10 to 12 million pieces were imported annually; in 1891 the figure was 8,500,000 pieces and in 1892 it exceeded 12 million pieces.

To conclude this review of the historical development of the manufacture of fire bricks and drain pipes, as a specialty in the district of Borovichi the production of stonewares for chemical use, the material of which is very much like the impervious pipes hard baked, should be mentioned. The production of this class of wares for the last two years has developed at the above mentioned factory of K. Z. Vachter, which has been greatly enlarged by buildings especially adapted to the purpose, and which now supplies the chemical works of the regions of St. Petersburg and Moscow with apparatus and appliances, the demands for which have also greatly increased of late, owing to the increased activity of the chemical factories. Bomboloes of all the usual dimensions, pipes with thin sides and vases for special use, such as closed mixture vases for the nitrogenizing process used in the production of smokeless powder, having a diameter of 2.5 arshines, earthen bottles for the keeping and shipment of acids, small jugs and the like, are made at Vachter's factory, of a quality which is in no way inferior to that of the wares produced in the centres of ceramic industry in Austria and Germany, which during the last ten years have furnished these goods to the Russian chemical factories including even those in the Ural, al-

though some 2,500 to 3,000 versts distant from the nearest foreign centres of ceramic manufacture, for example, from Aussig in Austria, Charlottenburg near Berlin, or Kraushwitz near Muskau in Prussia.

Considering eastern Russia with regard to the ceramic industry, it should be mentioned that in the governments of Viatka and Perm some of the districts have always been looked upon as places where ceramics were greatly spread as a household industry, for example, the Shadrinsk district of the government of Perm. In the twenties of this century a porcelain factory was established near Shadrinsk by Fetissoff Brothers. The plates produced at these works were not of the first quality, and were even classed as second rate at the first Russian Manufacturing Exhibition in St. Petersburg in 1828; but the works should, however, be mentioned as those which laid the foundation of the porcelain and faïence industry in the east of Russia. Later on, towards the sixties, other factories were established in the governments of Perm, Viatka and Orenburg, chiefly by immigrants from the Gzhel region, where the increasing cost of fuel began to tell against the entire manufacture of plates. The factory of Fetissoff Brothers prospered; it produced, of course, principally the more ordinary kind of wares, which supplanted at the local fair of Irbit the goods formerly brought from Gzhel. The factory at Shadrinsk no longer exists, but some fifteen years ago another factory for the making of faïence was established in the district, and has been owned until now by Smirnov Brothers. In the neighbouring government of Ufa a porcelain factory was established, already in 1864 in the town of Ufa. The official statistics, not counting the faïence manufactory, give the number of the different ceramic works in the Perm government as 14, including herein the establishments producing semi-earthen ware and tiles. This government is very rich in fire clays; for fuel, wood or coal is used, according to the locality. Nearly everywhere in the government of Viatka the simplest forms of ceramics are a part of household industry, but as yet no centralization of it in manufacturing establishments has been noticed. However, in the district of Elabouga a factory making stoneware for chemical purposes, the production of which is second to that of Vachter's in Borovichi, has been founded at the large chemical works of P. K. Oushkov, situated near Elabouga not far from the river Kama, a powerful tributary of the Volga; this factory supplies only its own needs. P. K. Oushkov has developed this auxiliary industry of ceramics at his natrium factory in all its details, including even the making of mounting accessories, such as polished cocks, pumps and serpentine for refrigerators; it is very probable that with the growth of its dimensions the local establishment will furnish its wares to the other Russian chemical works.

In the south of Russia, where the making of pottery is wide spread as a household industry among the peasants, in many localities, deposits of excellent kaolins are found among those of former clays. The beds and qualities of these kaolins as well as the general deposits of fire clays in Russia, are described in this year's mining report and in a former work of M. Miklashevsky: «Deposits of fire clays in Russia», St. Petersburg, 1881.

To the already known, many newly discovered deposits on different lands are always being added of late. The most renowned beds of kaolins are in the southern region: those of the governments of Kherson, Ekaterinoslav, Chernigov and Kiev; more to the west, those of the government of Volyn; more to the east, those

of the government of Orenburg; toward the north, the white clays of the government of Tula, namely, those found in the Yassensk clay pits, and those of the Dankovsk district of the Riazan government, are the most renowned, used chiefly in the making of fire bricks. The deposits near Gloukhov, government of Chernigov, were first known; they have until now a great importance for the Russian porcelain manufactories, because it is from here that they get the supply of the very fatty china clay to which they are accustomed, and even find necessary to add in small quantities of 5 to 10 per cent to the porcelain mass. The best sort of such kaolin is found at the village Poloshki, 8 versts distant from Gloukhov; at the present time over 200 to 300 thousands poud of this white clay is produced here yearly, the greatest part falling to the estate of Skoropadsky; the mining of the clay only takes place during the cold weather, namely, during the 2 or 3 winter months. The prices of such material are high; the Russian china factories pay for it more than a rouble per poud, freight included, that is, over 30 dollars per ton.

The clay found in the Gloukhovsk locality in its dry state presents pieces of considerable hardness and of a pure white; the upper layers are sometimes yellowish; when kneaded into paste with water, which is a rather hard process, it forms a very tender, immensely sticky mass, so that owing to the exuberance of its plasticity the highest sorts of it cannot be used for the shaping of wares without the addition of other more meagre clays. When English Cornwall kaolin is used in the production, most of the Russian manufactories find it necessary to add some of this fatty clay to the mass. Many small porcelain factories were established long ago in the Chernigov government near the deposits of kaolin; but they are no longer in existence. The largest and the most renowned of them was the factory of the proprietor, A. M. Miklashevsky, in the village Volokitino, district of Gloukhov, founded in 1839; this manufactory was able to compete in the quality of its wares with the best foreign makes. Besides perfect plates, objects of considerable dimensions were also made, evidences of which are to be found to this day in the village Volokitino, namely, all the *ikonostases*; the large lustre and the high candlesticks in its church have all been made at this factory. Notwithstanding its great technical success, this establishment closed its doors in the beginning of the sixties for some unknown reason.

In the government of Kiev among the deposits of fire clays, situated in the districts of Kiev, Vassilkov, Zvenigorod and Kanev, very delicate and pure kaolin, good not only for the making of faïence but for china as well, is to be found. One of the most renowned beds is the *mezhygorsk* near Kiev, at which at the end of the last century the first Crown porcelain factory was officially established. In 1798 an order was issued to install a Crown faïence factory within the walls of the abolished *mezhygorsk* monastery, and to assign 228 peasants to the works; later on, the number was doubled. At this manufactory 22 foremen, 80 pupils and 40 workmen were formerly engaged. The *mezhygorsk* Crown factory was during a long time the best representative of the production of earthenware in south-eastern Russia; the plates made there were famous in Russia, and until the thirties were almost the best, although the cost of the works and still more the expense of the freight to the principal markets, rendering the *mezhygorsk* wares dearer than the English makes, greatly impeded their sale and embarrassed the industry. Now that the development of the large manufactories in the Gzhel has reached such a

high degree of perfection, and has taken the first place in all Russia with regard to their trade returns, no such factories are to be found either in the government of Kiev, nor in all the other governments of the south, except those of Volyn and Kharkov, reckoning as the south of Russia all the territories lying to the south of 52° north latitude; but there are as before many small peasant workshops, and a certain number of larger manufactories for ordinary potter's work and for Dutch tiles. In the following nine governments: Voronezh, Ekaterinoslav, Kursk, Kharkov, Kherson, Taurida, Kiev, Chernigov, and in the district of the Don Cossacks, there are 54 special potteries, while in all European Russia there are 186. The greater part of these 54 southern manufactories of pottery and Dutch tiles, namely 23, are found in the government of Taurida.

Among the southern kaolins of the above-mentioned places the excellent Kherson kaolin is, besides the Gloukhovsk clay, at present much worked up. Its exploitation has been of late very considerably developed, chiefly in the strata of the Krivoy-Bog, where the celebrated iron ores are also found. It is used not only locally but is also exported. In the government of Kharkov the faience manufactory of Mr Nikitin, about 50 versts from Kharkov, established in the year 1860, endeavoured to use, in the beginning of the 8th decade, the kaolins of the governments of Ekaterinoslav and Kherson in the manufacture of their wares. About that time the manufactory was transferred to M. S. Kusnetsov, was rebuilt by this enterprising gentleman, and has now become the chief centre of faience manufactory for southern Russia.

Its importance to the Empire consists in its being the great centre for the employment of southern (Kherson) kaolins, and for its having become the medium for the use of home material in other manufactories. Of the three southwestern governments of Russia, Volynia, Podolia and Bessarabia, the kaolin strata of the first-mentioned are largely used, which are found in the circle of Novgrad-Volynsk and Zaslavel, for instance, near the villages Korets, Gorodnitsy and Baranovka. In these districts the first porcelain and faience manufactories were established as early as the commencement of this century. They were conducted in those days by the representatives of the aristocracy.

The first manufactories of Korets faience and porcelain, in the village of Korets, were those of the Countess Pototsky, of De Meseram in Baranovka, of the Prince Chartorizhsky in Gorodnitsy, which afterwards went into the hands of Mr. Rulikovsky, and which, in the aggregate of its wares, occupied the first place among the manufactories of the government of Volynia. At the present time these works remain, some in the same places as before, but in the hands of other proprietors; and some have been replaced by new establishments, for instance, in Baranovka the former manufactory, at present considerably improved, has passed into the hands of the Princess Kasimira Grokholsky; in Gorodnitsy there is a manufactory which has been transferred from Rudolf Bossy to B. I. Inghistov, and is now worked by Felix Susman.

The most important faience and porcelain manufactory of this district, in importance and in the aggregate of its productions, belongs at present to the Princess Ludgard Yablonovsky, of the Novgrad-Volynsk district, village Kameny-Brod, although it is also worked by Isaac Susman. Besides these there are smaller previous-

ly existing works in the hands of I. I. Plachkovsky (formerly A. Peters), of the same district, in the village Dovbysh, and of Isaac Hershfeld in the district of Zhitomir, village Baramy. The total value of the production of all the present porcelain and faïence manufactories of the government of Volhynia reaches the sum of 175,000 roubles, whereof 125,000 roubles fall to the share of the chief manufactory of the Princess Yablonovsky.

Passing over into the western region of Russia, there are in the Polish governments, namely, Warsaw, Kalish and Radom, at the present time some faïence and porcelain manufactories which turn out a moderate amount of goods, the greater part of which fall to the share of German firms, for example, Teichfeld, Shreer and Engelman, Freidenreich, Rauch, in all at present 7 manufactories. The wares turned out of these manufactories consist particularly of faïence goods, to the amount of 375,000 roubles. In the neighbouring northern governments, Grodno, Vilno, Kovno, and Vitebsk, there are only some small manufactories for potter's work, 11 in all; in the first two governments there are a great many brick manufactories, which branch of the trade is more developed in the government of Grodno. In the same government there is a small porcelain and faïence manufactory belonging to Mrs. Fanshaw, district Belsk, estate Pakanevo, founded in the year 1879. In the Baltic governments, where there are some comparatively great centres of potter's work, particularly in Livonia, are found two porcelain and faïence manufactories which are distinguished not only for their home trade, but also for their exports into the neighbouring provinces of the northern region. The most important of these is in Riga, and belongs to M. S. Kusnetsov; the other lies in Müllgraben, a suburb of the town, and belongs to I. K. Essen and A. K. Khrapunov. The porcelain manufactories in Riga were established in the year 1843 by Sidor Terentjevich Kusnetsov, the father of the present proprietor. Before that, there was in this place a manufactory belonging to Kamarin, which was bought by M. S. Kusnetsov for a considerable sum, and afterwards closed. S. T. Kusnetsov bought a parcel of ground and built a new manufactory on it, which is working now. At present this factory, under the management of his heir, has become one of the most important centres of the great earthenware trade of Russia. The manufactory of Essen, one of the most active merchants of Riga, was established 1887, and makes very good porcelain. The annual value of its production is, however, equal only to one-fourth of the above-named manufactory.

For all Russia, as well as for the St. Petersburg market, the greatest portion of the faïence and porcelain goods are furnished by the manufactories of M. S. Kusnetsov. The porcelain and faïence manufactory of Ivan Emeljanovich Kusnetsov, which, as well as the above-named works of M. S. Kusnetsov, arose in Gzhel, and is situated in the government of Novgorod, near the station Volkhov of the St. Petersburg-Moscow Railway on the river Volkhov, on the very frontier of the government of St. Petersburg, is also of no small importance to the St. Petersburg trade.

The two celebrated porcelain manufactories of St. Petersburg are known from their great importance beyond the bounds of the country. The older one, the Imperial manufactory, in the artistic finish of its production is beyond all competition, and is known through all Europe. The other, the manufactory of the Kornilov Brothers, which must, from the merit of its productions, be placed, immediately after

the Imperial manufactory, at the head of all other Russian porcelain works, is known in America, where it has sent during the last few years its productions decorated in the Russian style. The Imperial porcelain manufactory, established in St. Petersburg in the middle of the last century, produces goods for the current necessities of the Imperial Court of a common kind, as well as for decoration, such as table and tea services, and a small number of ornamental and artistic productions.

From an artistic, as well as from a technical point of view this manufactory is at the present time a model, in spite of its very limited output, which places it in an unfavourable position. This is owing to its reorganization during its last period of management, which began in 1880. The high position in an artistic sense which it has long occupied, is well known to the amateurs of the ceramic art and to juries of the international exhibitions. (See, for instance, Exhibition of the Works of Industry of all Nations, 1851, London, Reports by the Juries, p. 542, Official descriptive Catalogue 318, p. 1376; *Relazione sulle industrie ceramica e vetraria all' esposizione universale de Vienna nell' anno 1873 del Giurato Richard cav. Giulio, Milano 1874, pag. 65; Oesterreichischer Bericht über die Weltausstellung zu Paris im Jahre 1867: IV, Glas- und Thonwaarenfabrication, Wien 1868, p. 217—218).*

In their reports the foreign juries mention the attention and high personal interest which the Emperors, particularly Alexander II, took in the success and improvement of this branch of art in their countries\*.

Of the artistic articles produced of late in the Imperial porcelain manufactory a classic service called the Raphael service, the painting of which has been taken from the *laggio* of the Vatican in all its details, attracts at the present time particular attention from the large number of the finest, most excellently painted vases.

Among its painters the manufactory numbers master artists, such as Krasovskiy, T. Tarachkov, and the sculptor A. K. Spiess, the manager of the artistic and technical division, L. L. Schaufelberger. Stencil work is totally excluded here, the more so as the productions of the manufactory do not come into the trade. Among the methods of technical decoration the coloured glaze produced at a high temperature, which has been lately worked out here by the chemists of the manufactory, the technical engineers K. J. Klever and J. K. Byk, is particularly remarkable. This glaze adheres to hard porcelain without any modification in its composition and gives an effect analogous to that on the present porcelain *nouvelle* of Sevres, or in Berlin *Segger-Porcellan*. Among the strains from the great heat there are most remarkably clean red colours, well known to be the most difficult, and which have been rediscovered only lately.

---

\* ...Ma chi veramente anima e sostiene col suo valido patrocinio questa e le altre manifatture Imperiali è S. M. lo Czar che, per mostrare quanto degna stima faccia dell'industria e quanto ardentemente desidera di vederlo estendersi e progredire ne'suoi Stati, onora frequentemente della sua presenza le suaccennate manifatture, studia ed osserva ogni cosa, entra nei più minuti particolari e vuol rendersi conto di tutto. Il diploma d'onore conferito alle fabbriche Imperiali fu specialmente dedicato allo Czar come pegno di riconoscenza che l'industria da lui incoraggiata e protetta offre al degno successore di Pietro il Grando... (Richard cav. Giulio, l. c., p. 67).

The artistic and technical activity of the Imperial manufactory acquires a peculiar importance through its being an open school and direct nursery of special art and knowledge for the other porcelain manufactories of Russia. These latter may draw advantage from this school, in so far as it is possible to them, as well in the nature of their commercial activity as in technical organization. Notwithstanding the limited production of the Imperial manufactory the value of its articles annually produced amounts to 100,000 roubles; it occupies 175 workmen. The manufactory has in its large and well-furnished rooms, 4 blast furnaces, with a return air current. The mechanical driving power of the lathes is directly transmitted, at greater distances, by compressed air from compressors. There are two steam engines of 40 horse-power. Crushing mills acting after the runners, built of quartzite, and mechanical sieves work wet mills (Nassmühlen).

In the mould division there are mechanical lathes for round moulds, a compound set of rollers consisting of two roller systems with an intermediate lift by the elevator, an automatic sorter, and a steam injector for blowing out the dust. In the divisions for preparing the clay there are many cisterns, baking or drying. Meissen stoves, grinding apparatus (for the Gloukhovsky clay), 8 tubs in 3 stories for keeping and rotting the clay, Phor's mechanical roller lathes for kneading the ready mass before the working of it begins.

After the white hall, where the moulding of the articles is carried out, follows the workshop of the sculptor. In the adjoining wings are the rooms of the painters on porcelain. The great rooms of this division are, in their internal decoration, at the same time a sort of museum of the productions of painting on porcelain. Near these is the museum of the manufactory, which warehouses a remarkable collection of artistic porcelain articles of foreign schools, and the productions of the manufactory itself.

The porcelain works of the Kornilovs, in the artistic productions of which the talent of the school of the Imperial manufactory is expressed, was founded in St. Petersburg by the former dealer in porcelain articles, M. S. Kornilov, in the year 1835. Before this time there was in St. Petersburg, on the Viborg side, the porcelain manufactory of Batenin, founded after the war of 1812. This manufactory was known during the life of its proprietor, till the year 1835, by its middling and cheap sorts of wares. After the death of Batenin the works came under the management of the Court of Wards, and was closed a short time afterwards. Among the artistic productions specially belonging to the manufactory of Kornilov may be mentioned the remarkable articles in the old Russian style, scoops, cups, plates with Russian ornaments, plates with paintings from Russian life, some of them by the genial hand of Karasin, with typical scrolls and similar productions of a purely national character. These productions of the manufactory of the Kornilovs are known, as was mentioned, in America; from the year 1886 they have been imported into the United States for the well known firm of Tiffany & Co., Union Square, New York; this firm is for New York, the same as the Louvre for Paris, and has branches in London, 5 Argyll Place, W., and in Paris, Avenue de l'Opéra. They are remembered also by the visitors to the Paris Exposition of 1869, at which the greater part of the articles exhibited by the Kornilovs was bought by Americans.

The annual production of the manufactory amounts to 300,000 roubles and it



occupies nearly 300 workmen. The comparatively moderate prices favour a dissemination of the excellent articles among the public. In the economical organization of the manufactory the method of cleaning the fluid porcelain mass attracts attention. It is done by electro-magnets which draw out of the mass the magnetic iron particles. This method, carried out with the aid of a small dynamo engine and many electro-magnets with brush like poles through which is filtered the slowly flowing mass, was introduced into Russia by S. M. Kornilov, to whom also belongs the credit of the construction and application of electro-magnets to this purpose, which is more convenient than the Breget apparatus.

In the division for preparing the clay mass the factory works by means of dry crushers, in runners, and afterwards in Alsing drums. The Gloukhovsk clay, which is added to the mass, is ground and kneaded with water separately from the other integral parts. A membrane pump carries the fluid mass to the electro-magnetic apparatus, through which it flows to the filter presses; 7 furnaces of moderate diameter for burning the porcelain, work with wooden fuel; and there are 16 mufflers and 50 places for turners. The chromolithographic method in painting is used to a large extent. The chief sale of the articles of this manufactory is in St. Petersburg and Moscow.

The small porcelain manufactory of F. E. Emelianov in the Schlüsselburg district completes the number of the porcelain works in the St. Petersburg government, where besides this, as is usual near a capital, are found several small potteries producing particularly Dutch tiles, white and coloured pipes, and coloured plates.

Finally, in the north, in Finland, where there are altogether nearly 20 potteries producing articles of earthen ware and Dutch tiles for stoves, and where in the neighbourhood of great towns (on the sea shore or on the railway lines), there are some establishments for roofing tiles, two large faïence manufactories, the *Arabia* and that of W. Ansten, deserve particular mention. The latter is celebrated, among other things, for its excellent tiles for stoves and its ornamental works, while the manufactory *Arabia*, the importance of which for Russia was mentioned above, produces faïence of a high quality, and soft porcelain. The manufactory uses, as material for the faïence, imported English clay and black river flint, and applies very complete technical methods, particularly in the most important part of the work, namely, the preparation of the clay mass.

Besides the faïence wares the majolica of the same manufactory, attract attention by the cleanness of their painting and finish. The most characteristic goods are large decorative pieces, such as vases and plaques, with large white or cream drawings on a perfectly black glazed ground. The output of the manufactory *Arabia* amounts to 200,000 roubles, that of Ansten to 60,000 roubles.

Summing up what has been said in the foregoing account, especially with reference to the highest sorts of ceramic productions, porcelain and faïence, a more minute description of the present situation of these two branches in Russia may be given. The most considerable porcelain and faïence works, that is to say, those in which the extent of their production and sale, and the low wholesale prices are of great importance for the home trade, are the five great manufactories of M. S. Kousnetsov, as follows:

1. The works in Riga, consisting of 4 large divisions, each being an independent manufactory in separate buildings, and with a distinct management. It produces faïence of the highest quality, half-faïence, and porcelain of both high and common quality. The number of workmen engaged is 950, and the annual value of the production, 600,000 roubles. There are 18 furnaces and 5 steam engines, together of 154 horse power.

2. The manufactory in Tver (formerly Auerbach's, transferred 1871) under the firm of M. S. Kousnetsov & Co., which has preserved its former specialty of faïence production, and consists now of two divisions, one for high and the other for medium grades, with 1,220 workmen, and an annual production of 500,000 roubles; it has 12 furnaces, 4 steam engines of 88 horse power.

3. The oldest (1832) and largest manufactory in Dulevo, of the Pokrovsk district in the government of Vladimir, has for its specialty porcelain only. There are two divisions, for high and common porcelain. This manufactory is distinguished by furnaces of particularly large dimensions. Nearly all the furnaces have an inner diameter of 10 arshines (7.1 metres) and a height of 7 arshines (4.27 metres) to the arch. In 1884 there were in this manufactory 4 such furnaces; three of them, for common porcelain, and one for higher grades. At present there are 6 furnaces, 29 mufflers for burning in the colours, 220 potters lathes and 27 lathes for polishing. In the painting halls there are 466 places; there are two steam engines of a total 93 horse power. The fuel for the manufactory is peat; the light, electricity. The whole number of workmen is 1,400; their total annual earnings, 316,000 roubles. The annual production of the Dulevsk manufactory amounts to 600,000 roubles.

4. The manufactory in the government of Kharkov, district of Kharkov, volost Korotichansk, village Budy, remarkable for its using the kaolin of southern Russia, produces especially faïence ware. Reorganized by M. S. Kousnetsov in the year 1887, it has been considerably enlarged of late; it has 6 ovens and 3 steam engines of 50 horse power. The annual production amounts to 200,000 roubles, with 620 workmen.

5. The manufactory of the government of Moscow, formerly of Gardner, district Dmitrovsk, village Verbilky, which is held in history to be the first porcelain manufactory of Russia, founded nearly at the same time as the Imperial manufactory in St. Petersburg, has been more than a century in the hands of the Gardner firm, and produced in the first 75 years of its activity exclusively porcelain. It was the fifth porcelain manufactory in Europe in point of date, being outranked by those of Meissen, Vienna, Berlin and Munic. At the present time this manufactory has for the production of porcelain and faïence, 12 furnaces of moderate size, 38 mufflers and 1 steam engine of 30 horse power; it produces porcelain and faïence wares worth 200,000 roubles per year.

Consequently all five manufactories of M. S. Kousnetsov represent an annual production of 2,100,000 roubles, while the production of all the 47 porcelain and faïence manufactories of Russia together exceed 4 million roubles. Nearly the half of the production of the country is represented by these five large manufactories. Among the other 42 manufactories, the porcelain and faïence works of I. E. Kousnetsov at the station Volkhov, owing to its great output, should be mentioned first; its production amounts to 360,000 roubles, with 280 workmen (1890). Then come the Moscow manufactories, the representatives of the present Gzhelsk porcelain

industry in its former sites; two firms of Markov, G. A. and A. N., in the district of Bronnitsy, each with an annual production of 100,000 to 150,000 roubles, and with 320 to 380 workmen; and the firm J. G. Khrapunov, district Bogorodtsk, with a production of 170,000 roubles, and 285 workmen. Besides these large establishments, there are in the same districts 11 smaller works, with an annual production of 200,000 to 230,000 roubles in all. In the government of Vladimir there are two more old Gzhelsk firms, that of Sabanin and that of Zatsépin. The chief specialty of all the existing Gzhelsk manufactories is porcelain tea services.

The following statistical table gives a recapitulation per government, with the chief data of the production of the porcelain and faïence manufactories in 1890.

| GOVERNMENTS.             | Number of manufactories. | Value of production in roubles. | NUMBER OF WORKMEN. |        |         |         | TOTAL.   | Monthly wages in roubles. |
|--------------------------|--------------------------|---------------------------------|--------------------|--------|---------|---------|----------|---------------------------|
|                          |                          |                                 | Adults.            |        | Minors. |         | Workmen. |                           |
|                          |                          |                                 | Men.               | Women. | Male.   | Female. |          |                           |
| Of European Russia . . . | 37                       | 3,854,000                       | 6,512              | 1,335  | 431     | 211     | 8,489    | —                         |
| Vladimir . . . . .       | 2                        | 610,000                         | 1,050              | 129    | 220     | 50      | 1,449    | 8—30                      |
| Volynia . . . . .        | 5                        | 178,000                         | 264                | 30     | 10      | —       | 304      | 10—24                     |
| Grodno . . . . .         | 1                        | 18,000                          | 30                 | 10     | —       | —       | 40       | —                         |
| Kaluga . . . . .         | 1                        | 70,000                          | 120                | 110    | 20      | 50      | 300      | 12—25                     |
| Livonia . . . . .        | 2                        | 740,000                         | 895                | 230    | 61      | 35      | 1,221    | 13—50                     |
| Moscow . . . . .         | 14                       | 700,000                         | 1,401              | 473    | 38      | 60      | 1,972    | 3—15                      |
| Novgorod . . . . .       | 1                        | 260,000                         | 525                | 40     | 15      | 5       | 585      | 12—30                     |
| Perm . . . . .           | 1                        | 3,000                           | 20                 | —      | —       | —       | 20       | 5—12                      |
| St. Petersburg . . . .   | 2                        | 411,000                         | 288                | 14     | 8       | —       | 310      | 15—60                     |
| Tambov . . . . .         | 4                        | 26,000                          | 112                | 5      | 5       | 5       | 127      | 4—20                      |
| Tver . . . . .           | 1                        | 500,000                         | 993                | 173    | 42      | 6       | 1,214    | 8—10                      |
| Kharkov . . . . .        | 2                        | 206,000                         | 575                | 93     | 12      | —       | 680      | 8—25                      |
| Yaroslav . . . . .       | 1                        | 40,000                          | 239                | 28     | —       | —       | 267      | 10—20                     |
| In Poland . . . . .      | 7                        | 375,000                         | 583                | 242    | 4       | 6       | 835      | —                         |
| Warsaw . . . . .         | 4                        | 276,000                         | 320                | 160    | —       | —       | 480      | 6—60                      |
| Kalish . . . . .         | 2                        | 65,000                          | 165                | 64     | —       | —       | 229      | —                         |
| Radom . . . . .          | 1                        | 34,000                          | 98                 | 18     | 4       | 6       | 126      | 8—40                      |
| In Siberia . . . . .     | 3                        | 175,000                         | 174                | 23     | 3       | 2       | 202      | —                         |
| Yenissei . . . . .       | 1                        | 1,000                           | 4                  | 3      | 3       | 2       | 12       | 15—20                     |
| Irkutsk . . . . .        | 2                        | 174,000                         | 170                | 20     | —       | —       | 190      | 15—75                     |
| Total . . . . .          | 47                       | 4,404,000                       | 7,269              | 1,600  | 498     | 219     | 9,526    | —                         |

Among the smaller firms beyond Moscow there are some which produce especially faïence; they make only table ware and some other small articles, for instance, vessels for apothecaries such as jars for salves and for preserving materials. Two small manufactories of the government of Tambov, and on the eastern side, one of porcelain in Ufa and one of faïence in Perm may be noticed. More important than these are those which are situated more westerly and centrally, for instance, the manufactory in the government of Kaluga which was always very popular among the people of an extensive area round about; the faïence manufactory in Pesochna, village Pesochensky, district Zhisdrensky, of General S. J. Maltsov, which manufactures from home clay, and was founded in 1853; and another faïence manufactory of the same proprietor in Lubokhna, in the same vicinity, in the district Briansk of the government of Oriol, founded in 1880. The faïence manufactory in Pesotchna, which attracts attention in the present case and which is almost lost sight of in the whole group of the manufactories of Maltsov, produces at the present time faïence ware of middle quality but at an exceedingly cheap price, and to the value of 70,000 roubles (the production of former years amounted to 100,000 roubles), with 300 workmen, 4 steam engines and 3 water wheels with a total of about 90 horse power. Referring to the above-mentioned porcelain and faïence manufactories of the government of Volynia, which use in their manufacture home kaolin, and which avail themselves of the rare advantage in Russia of having their own home spar and quartz, this general account of porcelain and faïence manufactories in Russia may be closed.

This preceding table shows that the total annual production of porcelain and faïence in Russia represents 4,404,000 roubles and that the main part of this production falls to the share of those governments where, as explained above, the former manufactories of Kousnetsov are situated, namely, in the governments of Vladimir, Livonia, and Tver; and then, in the governments of Moscow with its 14 large and small manufactories, and St. Petersburg with its two porcelain works.

As material for the Russian porcelain and faïence works, besides the home kaolins of different places, such as the Gloukhovsk, Khersonsk, Volynsk, Gzhelsk, and some other home faïence clays, the English imported kaolin is also used, the import of which into Russia is very considerable. The English china clay from Cornwall is imported of different sorts, beginning with the first quality which costs, for instance, in St. Petersburg 40 to 50 kopecks a poud, or about 15 dollars per metric ton, and going on to the fourth grade which costs 18 to 20 kopecks a poud, and is used, for instance, for telegraph insulators. Estimating with the foregoing that quantity of china clay which is used in paper manufactories, and which may be rated equal to that for the earthenware production, that is to say, about one-half of the whole demand for both purposes, the import of the china clay of Cornwall would amount to nearly 800,000 pouds a year, of which about 400,000 pouds are used in porcelain and faïence manufactories. Among the different sorts of china clay the blue is imported, which is sometimes used for faïence.

The feldspar and quartz for porcelain is brought from Finland and Norway, and from the government of Olonets. Besides this, as mentioned, the manufactories of the government of Volynia have their own feldspar; and near Ekaterinburg is found a quartz, and particularly spar, known under the name of Siberian. Quartz and spar are nearly of the same price, and cost on an average, quartz 18 to

25 kopecks, and spar 25 to 30 kopecks a pound. The English kaolin is received in a condition quite ready for use, namely, finely ground. This fact, together with the high price of the transport of the Russian kaolins to the large manufactories, is a great obstacle to the substitution of Russian kaolin for English, the home material not having been worked out till now regularly enough, and not undergoing such a preparation as in England owing to the method of working it.

The quartz and feldspar are always used after having been burned and assorted, and it should not be forgotten that their cost to the manufacturer, after these preparatory operations, is from 50 to 75 per cent above that of the raw material. From other sorts of the home kaolin one pound of a ready first-class porcelain mass, which has undergone the most complicated preparation, costs at the manufactory 1.50 roubles; of a medium quality 1.10 roubles to 80 kopecks; and for the lowest grades, for instance for isolators, 50 to 60 kopecks a pound.

Among the materials, besides the home and foreign clays used in faïence works are, sand, sometimes river flint, and limestone which is known in the manufactories of Moscow under the name *opok*. Such limestone is obtained, for instance, from Gzhel, where it is found together with clay, and from Myachkov, where there are large pits of the Myachkovsk limestone. Side by side with the management of preparing the mass goes on the moulding work. For this kind of work the fire clay of Novgorod (Borovichi), which is delivered in St. Petersburg at a price of from 15 to 18 kopecks a pound, is most used at present. Round about Moscow, mould clay from Gzhel is used; Volynia has its own material. The mass or the weight of the moulds, which are now thinner than they were formerly, stand to the enclosed weight of porcelain as 12 or 10 to 1. The moulds serve 3 or 4 times, that is to say, they hold out 3 to 4 burnings. The furnaces of the manufactories are mostly of satisfactory construction; until now wood has chiefly been used for fuel. In the first burning it is used in the form of rough sticks, and then in the form of chips split and dried in the furnaces themselves, being laid on shelves in the open fire place for that purpose. In some places, if the furnaces are of very large dimensions, the wood is not split, as for instance in Doulevo. Coals replace wood for burning porcelain and faïence only in Riga, Kharkov, and in the Polish governments. The total quantity of fuel used in the porcelain and faïence manufactories of Russia was estimated for the year 1890 as follows: wood, cubic sagues 42,200, or about 410,000 cubic metres, about 10,500,000 pounds, or about 174,000 metric tons; coal, 1,661,000 pounds, about 27,200 tons. To this amount must be added an inconsiderable quantity of peat, which is used by the manufactory of Kusnetsov in Doulevo at the same time with wood; about 5,000 cubic sagues with about 1,250 cubic sagues of wood, according to special data, and by some Moscow manufactories, 600 cubic sagues. If 1 part of coals be assumed equal to 2 parts of wood, and 1 part of peat equal to three-fourths parts of wood, and expressing the sum in coal, all these sorts of fuel would be equal to 7,288,000 pounds, or about 120,000 metric tons.

Payment is made to moulders by the piece, and to other workmen per month, as is shown in the last column of the foregoing statistical table in those limits which it generally reaches per month, according to the kind of work, the locality, and partly, to the kind of production. Among the workmen employed, as is seen from the table, there is a certain percentage of young people of both sexes under

age. These are young workmen which are used as carriers; they give to and take from the moulders and turners, or are engaged in making small pieces which are generally formed in gypsum, such as arms, and noses. Women's work is almost exclusively the cleaning of articles after they have been glazed and dried in the air.

The payment for work becomes in the Russian manufactories, as well as elsewhere, in the course of time dearer than at the beginning. The following example of lowest and highest monthly wages for the corresponding categories of workmen, especially in the porcelain production, where the difference between these categories is the most marked, shows this item of expense for two periods of time.

The medium payment per month in the best porcelain manufactories of Russia was as follows.

|   | In the forties. | Now.        |
|---|-----------------|-------------|
| A man of all work, with lodging found. . . .                                    | 7—8.5 rbls.     | 15—18 rbls. |
| Turners and common painters (the former are generally paid per piece) . . . . . | 15—20 rbls.     | 40—60 rbls. |

On the average, according to the annual accounts, the expenses for the production in the porcelain manufactories which are occupied also with common painting, as nearly all of them are, are distributed in their different parts nearly in the following proportion.

| E X P E N S E S.                            | Percentage value of the production. |
|---|-------------------------------------|
| Wages for all parts of production . . . . . | 50 per cent.                        |
| Fuel . . . . .                              | 20 > >                              |
| General expenses. . . . .                   | 18 > >                              |
| Material for the clay mass . . . . .        | 7 > >                               |
| Clay for the moulds . . . . .               | 5 > >                               |
| Total. . .                                  | 100 per cent.                       |

The selling price of ready articles of the first sort from the best porcelain manufactories of Russia is for white articles without ornaments\* as follows:

\* Cheap printed ornaments are often for the manufactories a means of hiding deficiencies in the whiteness and cleanness of the surface of the article. Ornaments are therefore not always evidences of real value. On the other hand there are but few amateurs who prefer wares without any ornament\*, for instance, without painted brims.

White porcelain without ornaments costs on home markets per pound:

|  |            |
|--|------------|
| Plates 10 inches, 3 dozen plates per pound . . . . .                 | 9 roubles. |
| Service teapots and cups with saucers . . . . .                      | 13 >       |
| Salad dishes, tureens and milk pots . . . . .                        | 15 >       |
| Washbasins . . . . .   | 20 >       |
| Oval basins for fish. . . . .  | 25 >       |
| Various thin articles, as ashpans and other small articles . . . . . | 28 >       |

In fixing the average cost of porcelain in Russia excluding the prices of the last three categories of goods of no great importance, such large articles as washbasins being seldom demanded in porcelain, as less necessary articles of luxury, and therefore may be excluded from the account, it may be estimated that out of the first three columns, the average commercial cost of porcelain goods ranges from 12 to 12.50 roubles a pound. In like manner the average price for faïence of the first sort of Russian articles, may be placed at 4.50 to 5 roubles a pound; the price of the medium and lowest sorts, at 3 and 2.50 roubles, and the average price for all sorts may be taken as 4 roubles a pound.

The statistical data which, besides the two ceramic branches of the highest category, cover the more simple branches comprehended under the name of potters work and including the manufacture of Dutch tile, show that all the other ceramic manufactures of Russia, excluding bricks, amounted to 1,385,000 roubles in 1890. This sum is the gross of the output of about 200 pottery and tile factories with about 2,500 workmen, and does not include small home manufacture, this being an object of special statistics.

The above mentioned 200 pottery works have used the following amount of fuel: wood 15,370 cubic sagesnes, about 64,000 metric tons; coal, especially in the governments of Kharkov, Perm, Taurida and in Poland, about 202,000 pounds, 3,300 metric tons, which is equivalent to about 35,000 tons of coal.

The production of the brick manufactories for the year 1890 amounts to about 10 million roubles with about 30,000 workmen, and the following expense for fuel:

|   |                      |
|---|----------------------|
| Wood, 111,750 cubic sagesnes, about . . . . . | 465,000 metric tons. |
| Coal, 4,761,000 pounds . . . . .              | 78,000 tons.         |
| Turf, about 880,000 pounds . . . . .          | 14,400 >             |
| Naphtha residues, 80,030 pounds . . . . .     | 1,360 >              |
| Total coal equivalent . . . . .               | 316,000 >            |

Naphtha residues for burning bricks are used in the Caucasus, and to some extent in the government of Saratov, one part of naphtha being considered equivalent to one and a half parts of coal.

Thus, the value of the home ceramic production is found for the year 1890 to give the following amounts:

|  |                     |
|--|---------------------|
| Porcelain and faïence, together with earthenware and Dutch tiles . . . . .           | 5,789,000 roubles.  |
| Total, including the above mentioned, together with the brick manufactures . . . . . | 15,800,000 roubles. |

The import into Russia of foreign porcelain and faïence was always very considerable, notwithstanding that the duties fixed on these articles, 1 to 3.75 roubles a pound on faïence, and 5.30 to 21 roubles in gold per pound on the different grades of porcelain wares, have always sufficiently protected the home production. The development of the latter has been in general unusually steady and gradual, and particularly visible since 1878, just after the war with Turkey.

The amount of the annual import of porcelain and faïence in the last 20 years was as follows:

The value of porcelain and faïence imported across the European frontier:

|      |           |      |           |
|------|-----------|------|-----------|
| 1870 | 609,000   | 1881 | 937,000   |
| 1871 | 819,000   | 1882 | 1,140,000 |
| 1872 | 1,776,000 | 1883 | 874,000   |
| 1873 | 1,300,000 | 1884 | 779,000   |
| 1874 | 1,085,000 | 1885 | 812,000   |
| 1875 | 1,257,000 | 1886 | 803,000   |
| 1876 | 1,001,000 | 1887 | 530,000   |
| 1877 | 0,389,000 | 1888 | 591,000   |
| 1878 | 0,986,000 | 1889 | 739,000   |
| 1879 | 1,285,000 | 1890 | 650,000   |
| 1880 | 1,310,000 | 1891 | 752,000   |

In recent years the value of the imported faïence was nearly equal to that of the porcelain; for instance, in 1891, faïence was brought across the European frontier to the value of 383,000 roubles, and porcelain, 369,000 roubles. This proportion shows the predominance which faïence has over porcelain, as to the quantity imported. The average commercial value per pound of imported faïence is, according to the customhouse rating, for the three categories of articles, that is, articles without patterns, articles with patterns of one colour, and painted articles with patterns of various colours, 9 roubles, and 28 roubles respectively; whereas the prices of the corresponding three categories of porcelain are per pound 23 roubles, 45 roubles and 85 roubles, according to the valuation of the import of 1891.

As to quantity, there was imported in the year 1891, across the European frontier, of faïence about 32,000 pounds; and of porcelain; 9,400 pounds. In the year 1890 the import of faïence amounted to 30,000 pounds and of porcelain 7,540 pounds, with a value, for faïence, of 324,000 roubles, and for porcelain, of 318,000 roubles. Besides the quantities mentioned, faïence is brought across the Asiatic frontier, from about 10,000 to 15,000, and porcelain, 3,000 to 5,000 roubles.

The total value, therefore, of the faïence and porcelain imported equals about one-sixth of that of the home production, and the quantitative predominance which the faïence articles have in the import, corresponds to the comparatively weak state of that branch in Russia. At the same time the demand for faïence of good quality, arising out of the direct wants of the household, not only constantly exists, but increases faster than the home production. This predominance of faïence will always naturally arise from the fact that, in the household, the good durable faïence serves as well as porcelain, and is thereby in general the cheaper.

The best faïence until now for Russia has been the English, the German, and the



Dutch. Of the home production the faïence of Finland, which is used in the interior of Russia to the annual value of 60,000 to 65,000 roubles, is of great importance. Receiving this rather considerable quantity from Finland, Russia returns to the Grand Duchy its faïence of other sorts, and to some extent, its porcelain; for instance, Finland received in 1891 from the interior governments of Russia faïence to the value of 48,730 roubles, and porcelain nearly 5,700 roubles, a total of 54,430 roubles.

The faïence imported chiefly comes from Germany (Villeroy & Boch, and others) and amounts sometimes to one-third of the total import; England, the Netherlands, and in a less degree Austria, France and Denmark come next.

Simultaneously with the import exists a certain export of faïence and porcelain, which is directed across the European frontier, particularly into Roumania, Turkey, and to some extent to Germany; and of late years, of porcelain, to the United States of America. Porcelain is exported almost exclusively across the eastern and southern frontiers into Asia, and particularly into Persia. In 1891 there were exported into Europe and Asia faïence goods to the value of 29,000 roubles; porcelain into Europe and America for 98,000 roubles, and into Asia for 12,000 roubles; the total weight of porcelain was about 18,300 pounds. The whole export of porcelain and faïence amounted to 247,000 roubles.

Deducting this export from the total import, and adding the remainder to the sum of the home production, the amount of the home consumption in Russia of porcelain and faïence would be 5,000,000 roubles. The import into Russia of pottery, besides faïence and porcelain including drain pipes across all frontiers, strange to say, reaches in value the sum of the porcelain and faïence import together. The import of fire and common bricks, together with flooring tiles, common roof tiles and a small quantity of clay mass, amounted in 1890 to about 800,000, and in 1891 to about 860,000 roubles. Of these amounts fire brick and floor tiles form nearly three-fourths of the total.

Pottery articles of common and fire clay were imported as follows:

| Years.       | Pounds. | Sum.             |
|--------------|---------|------------------|
| 1890 . . . . | 230,970 | 782,208 roubles. |
| 1891 . . . . | 206,044 | 629,751    >     |

Such a considerable import proves that in Russia, among the products of the ceramic arts, there is a great deficiency of such articles as are most in demand for common household use. It is only of late, as may be seen from the foregoing account, that the foundations of a more complete development of the manufacture of articles of household use, and particularly of pipes and stoneware, have been laid, and that in the government of Novgorod. In any case it may be said that these foundations are sufficiently strong, and it may be hoped that in a short time the deficiencies in the home production will entirely disappear.

From the sum of the import and the home production the total commercial demand for ceramic articles of all three categories, namely, for faïence, porcelain and pottery, in Russia, amounts to not less than 7,000,000 roubles a year.



## CHAPTER XIII.

## Chemical Industry.

**I**N a statistical article the term «chemical industry» may either mean the exclusive production of acids, alkalis, salts like alum, blue copperas, chromates and pharmaceutical products like ethers and cosmetics; or else in a wider sense it may embrace many manufactures in which chemical actions and processes are taken advantage of, to obtain substances of the greatest variety, starting from dyes and ending with molasses, alcohol, illuminating gas, and the products of dry distillation. Although the manufacture of dyes is included in the present article, still «chemical industry» is understood in the first and more limited sense, not only because many of the manufactures founded upon chemical reactions are considered in the other sections of this work, but also chiefly because the manufacture of acids, alkalis and salts, like the alums and chromates, together with the preparation of dyes, forms quite a separate industry, whose products, although seldom met with in every day life, are indispensable to a multitude of industries and manufactures, and hence indirectly indicate the general state of the development of these industries. Moreover, in a number of chemical works the preparation of dyes is carried on simultaneously with the manufacture of acids and salts, and it is frequently impossible to separate the statistics of the one from those of the other.

When the industrial activity of the Russian nation was exclusively devoted to agriculture, then there were no real chemical manufactures in the Empire, and only a very few of the allied industries, such as distillery works, the preparation of tar and of certain dyes, for instance, madder, which on a small rural scale were carried on, not in works but only in the villages. To the present day the greater portion of the wood tar and resin is produced by industries having the same rural character. This is especially the case in the forests of northern Russia, which from ancient times have supplied many goods of this kind to the interior of Russia and abroad (Section VIII). But a true chemical industry, mainly treating substances of the mineral kingdom, only began to develop in Russia since the demand for those products arose with

the establishment of a manufacturing industry during the past century. Thus, the first chemical works arose as supplementary to other manufactories and works. This was particularly noticeable in Moscow, St. Petersburg, Ivanovo-Vosnessensk and Kazan.

| CHEMICAL PRODUCTS. | IMPORT OF SODA ACROSS THE EUROPEAN FRONTIER. 1. |          | TOTAL IMPORT ACROSS THE EUROPEAN FRONTIER. |                                   | HOME PRODUCTION OF CHEMICAL PRODUCTS AND DYES. 2. |          | Value of yearly consumption of chemical products and dyes. |
|--------------------|---|----------|--|-----------------------------------|---|----------|--|
|                    | Carbonate.                                      | Caustic. | Chemical products.                         | Average, and dyes.                | Total.  | Average. |  |
|                    | Thousands of pounds.                            |          | In millions of paper roubles.              |                                   |   |          |  |
| 1869 . . . .       | 491   | 61       | 3.5  | 66<br>+ dyes<br>14.3.             | 6.4   | 6.1      | 27.0   |
| 1870 . . . .       | 718   | 192      | 5.0  |                                   | 6.1   |          |  |
| 1871 . . . .       | 665   | 286      | 6.2  |                                   | 6.0   |          |  |
| 1872 . . . .       | 684   | 258      | 6.7  |                                   | 6.2   |          |  |
| 1873 . . . .       | 820   | 348      | 11.5                                       |                                   | 6.0   |          |  |
| 1874 . . . .       | 721   | 450      | 10.5                                       | 12.0<br>+ dyes<br>15.0.           | 6.2   | 5.4      | 22.4   |
| 1875 . . . .       | 720   | 477      | 15.1                                       |                                   | 5.2   |          |  |
| 1876 . . . .       | 851   | 492      | 7.5  |                                   | 5.5   |          |  |
| 1877 . . . .       | 513   | 394      | 5.6  |                                   | 4.9   |          |  |
| 1878 . . . .       | 895   | 705      | 21.4                                       |                                   | 6.1   |          |  |
| 1879 . . . .       | 1,080   | 620      | 23.1                                       | 20.7<br>+ dyes<br>18.4.           | 6.0   | 8.0      | 47.1   |
| 1880 . . . .       | 1,049   | 672      | 19.3                                       |                                   | 7.3   |          |  |
| 1881 . . . .       | 1,053   | 676      | 18.4                                       |                                   | 8.7   |          |  |
| 1882 . . . .       | 1,136   | 730      | 26.7                                       |                                   | 9.0   |          |  |
| 1883 . . . .       | 1,313   | 673      | 16.2                                       |                                   | 9.0   |          |  |
| 1884 . . . .       | 1,200   | 802      | 15.7                                       | 13.2<br>+ dyes<br>15.6.<br>+ dyes | 12.9  | 12.4     | 41.2   |
| 1885 . . . .       | 1,123   | 751      | 13.7                                       |                                   | 10.4  |          |  |
| 1886 . . . .       | 1,081   | 790      | 12.8                                       |                                   | 10.5  |          |  |
| 1887 . . . .       | 724   | 860      | 12.1                                       |                                   | 12.8  |          |  |
| 1888 . . . .       | 642   | 913      | 11.7                                       |                                   | 15.3  |          |  |
| 1889 . . . .       | 705   | 883      | 12.6                                       | 15.7                              | 14.6  |          | 42.9   |
| 1890 . . . .       | 754   | 943      | 12.1                                       | 14.5                              | 15.4  |          | 42.0   |
| 1891 . . . .       | 443   | 764      | 11.1                                       | 12.4                              |   |          |  |

The Russian chemical industry was further animated by the erection of works in distant parts where it was difficult for foreign goods to penetrate, and where a

demand arose for considerable quantities of acids, particularly sulphuric, and for its salts, especially blue copperas and the alums, potassium cyanide et cetera, produced from local materials, for example, pyrites. Thus, for instance, Ushkov's works on the Kama near Elabouga were founded in the fifties for converting the Ural chrome iron ore into chromic salts, and these works have commenced using Ural copper pyrites in large quantities. So also several sulphuric acid works were started in Baku during the seventies and eighties, for the manufacture of acid from Sicilian and Caucasian sulphur, and for treating the products of the distillation of naphtha. But, as the customs tariff of that period allowed the majority of the foreign chemical products to pass into Russia either free of duty or with only very small dues, the majority of these goods, especially caustic and carbonate of soda, bleaching powder, pharmaceutical preparations, and dyes, were almost exclusively brought from abroad. This is proved by the fact that the import of chemical products increased more rapidly at this time than the internal production, which only satisfied a very small portion of the Russian demand.

#### EXPLANATORY NOTES TO THE FOREGOING TABLE.

1. Besides the import across the European frontier, chemical products are also imported to the Asiatic ports of the Black Sea, especially to Batoum and Poti, for supplying the wants of the Caucasian naphtha industry. For instance, the following amounts of caustic soda were imported through the Asiatic frontier :

|       |       |       |                      |
|-------|-------|-------|----------------------|
| 1888; | 1889; | 1890; | 1891;                |
| 216   | 153   | 134   | 142 thousand pounds. |

Under the title of chemical products the customs tariff includes besides soda the import of Straasfurt salts, nitre, sulphur, antimony, arsenic, borax, cream of tartar, barium, strontium, aluminium, alums, ammoniacal and other salts and oxides, acetate of lime, bisulphide of carbon, various acids, copperas and green vitriol, and other chemical and pharmaceutical preparations not especially mentioned; but phosphorus, ether, soap, cosmetics, glycerine, matches, varnishes, et cetera, are not included. Among dyes and colouring matters the chief objects of import are: indigo, cochineal and other natural dyes, logwood, ultramarine, white lead and copper pigments, extracts of dyes and gall, alizarine and other artificial dyes, prepared dyes, ink and wax.

2. In the statistical reports the value of the yield of the chemical works is given together with the production of dyes, chiefly because many works produce both one and the other. But, as the extent and nature of the chemical industry cannot be accurately defined, there is often much that is contradictory and not clear in the official reports.

3. The chief cause of the decline in the value of the import during the seventies was the fall in the price of soda on the foreign markets; while the rapid rise of the import trade in 1878 is explained by the rise of all the customs duties; and the animated state of manufactures produced a rapid development of the home pro-

duction, and demand for chemical products required by other industries, while the home chemical works could not satisfy this increased demand owing to their previous feeble development, due to the fact that the duties upon chemical products in general were less protective than those on other goods.

4. The fall in the general value of the demands for chemical and colouring goods during the eighties was not due to a decrease in the demand, which on the contrary increased, but to the fall in price of many of the products and especially of aniline and artificial dyes.

It is evident from the data of the preceding table that the Russian chemical industry has from distant ages far from satisfied the demand, and although the home production of chemical products and dyes has increased, still it does not now exceed one-third of the demand. This is just the reverse from other manufactures, for example that of leather and paper, the home production of which greatly exceeds the import, from long ago. The cause of this must be looked for in the fact that chemical products, as auxiliary to other classes of industry, have long been subject to only very inconsiderable customs dues \*, and that therefore their import was only natural. While manufactured goods were subject to not under 50 per cent customs dues, chemical products paid scarcely 6 per cent. Under these circumstances the only chemical works possible were those producing acids, especially sulphuric and nitric, and a few other products which either offered some difficulty in transport and storage, or, as with green vitriol, alum, et cetera, were so cheap that the cost of transport into the interior formed a great impediment. But, when the customs duties on chemical products were raised in the eighties, it became possible for the young Russian chemical industry to compete with the already established foreign export trade; the already existing Russian chemical works enlarged their operations and new and more perfected enterprises were started. Among the latter may be mentioned the Tentelevsk Chemical Works near St. Petersburg, which for instance treated *bor-ite* and platinum ores, and carried on the manufacture of ultramarine and soda.

The fact that the raising of the customs duties during the eighties produced a marked although slow improvement in the home chemical industry, and also that many of the most important raw materials necessary for the full development of this industry, such as pyrites, sulphur salt, phosphorite, bone, et cetera, were known to exist in Russia, was taken into consideration in the revising of the customs tariff in 1891. The duties on foreign chemical goods, without being essentially revolutionized, were systematized, while in some few cases, for example, acetate of lime and caustic soda, the duty was raised. The fruits of such a procedure, which was only enforced in 1891, have already shown themselves in the increased produc-

---

\* For example, in 1873. the import of sulphur amounted to 310,000 pounds; that of saltpetre from Chili, 304,000 pounds; of barium precipitate, 121,000 pounds; of salts of ammonium, 29,000 pounds; of sulphur-aluminous salt and alum, 111,000 pounds; of all kinds of soda, 1,168,000 pounds; of white lime, azotic and muriatic acids, 298,000 pounds; of acetic, oxalic and other acids, 18,000; the total amounting to 11,500,000 of roubles paper; the duties on these wares amounted to 68,000 roubles paper, or about 6 per cent of the value. In 1888 to 1890 the customs duties formed about 25 per cent of the value of the chemical imports, and the increase of the duties corresponded to the increase of the production of the Empire.

tion of soda, bleaching powder, and certain other substances which will be mentioned hereafter.

Thus the chemical industry of Russia can only be considered as being at the first stage of its growth, and its further progress can only be looked for in the further development of other kinds of industries offering a demand for chemical products. And as regards certain of them, when their exploitation attains its requisite and possible dimensions, then the natural conditions of Russia are such that it can produce an abundance of goods of the kind. Thus for instance, native hydrated sulphate of sodium, glauberite, or mirabilite occur in abundance in certain of the Central Asiatic lakes, in a dried up lake near the Zhandarmusk mountain near Tiflis, and is self-deposited in large and small lakes in the neighbourhood of Batalpashinsk not far from the Black Sea, to the north of the Caucasus, and in many other localities. Its exploitation has hardly been commenced, but when developed it could form a means for the manufacture of exceedingly cheap soda and caustic soda, as in Leblanc's process common salt has first to be converted into glauber salt, which requires the manufacture of sulphuric acid, and hence of hydrochloric acid, the demand for which is not sufficiently great.

This native glauber salt might also be a source of sulphur, which is now imported from Sicily. The vast masses of copper pyrites occurring in the Urals are now hardly touched, and are only converted into sulphuric acid on the spot at Polovtsev's works, and on the Kama. The pyrites occurring at Borovichi, and in the Sub-Moscow and Donets coals, are only converted into sulphuric acid at small works, while they might serve as a most profitable source for the preparation of sulphuric acid and its by-products. The exploitation of the vast beds of native sulphur in Daghestan in the Caucasus, and in the Kara-Koumsk steppes in Transcaucasia, has hardly been started, although they are not inferior to the Sicilian deposits, and offer the important advantages of being near the surface and of being very rich. A similar untouched treasure-house is presented in the exceedingly thick beds of pure alumite or alum stone, discovered beyond the Caucasus at Zaglik in the government of Elisavetpol. Such stores of wealth, together with the inexhaustible deposits of phosphorites in the governments of Podolsk, Riazan and Smolensk, of manganese ore in the Caucasus, Dnieper and Ural, of chrome iron ore in the Ural, of nickel ore in the Ural, and of many other minerals, and also an abundance of every class of vegetable and animal raw stuffs suitable for chemical treatment, and for the preparation of most varied chemical products, all this wealth is still awaiting the hand of enterprising individuals to be converted into goods capable of export to other lands.

In a word, the natural conditions favourable to a vast and independent development of a large chemical industry in Russia, are so numerous that, when the home production attains its full growth, it will not only be able to satisfy the home demand in excess, but to attain such a degree of cheapness as would open the foreign markets to its goods. At the present time, however, it is only possible to bear witness to a feeble beginning in the growth of the Russian chemical industry, and for this purpose a short review of the production of certain of the most important chemical products will be given.

It is well known that the manufacture of sulphuric acid forms the basis of the

chemical industries. This acid is now produced in various parts of Russia, and its total production must now be counted as not under four million pounds; that is, of concentrated acid containing from 90 to 95 per cent of hydrate  $H_2SO_4$ . The material employed for its manufacture is still mainly sulphur. The following figures give the amount of Sicilian lump sulphur imported:

|                               | 1888. | 1889. | 1890. | 1891 |                   |
|-------------------------------|-------|-------|-------|------|-------------------|
| Across the European frontier. | 1,114 | 993   | 871   | 588  | thousand pounds.  |
| » » Asiatic » . . .           | 249   | 173   | 254   | 241  | » »               |
| Total. . . . .                | 1,363 | 1,166 | 1,025 | 829  | » »               |
| Value. . . . .                | 1,086 | 865   | 988   | 654  | thousand roubles. |

The decrease of the import is mainly due to the fact that the Russian works, such as those of Oushkov, Hill and others, have followed the example of the Western European factories, and began manufacturing sulphuric acid from pyrites, which they either bring from abroad or extract in Russia.

The following figures give the amount of sulphur pyrites imported:

|                       | 1886. | 1887. | 1888. | 1889. | 1890. | 1891. |
|-----------------------|-------|-------|-------|-------|-------|-------|
| Thousand pounds . . . | 225   | 186   | 275   | 289   | 141   | 744   |
| » roubles . . . . .   | 21    | 58    | 98    | 61    | 47    | 167   |

The home exploitation of native sulphur is still very small, altogether about ten thousand pounds were extracted in Daghestan, in the Caucasus, and in the Transcaspien provinces in 1889 and 1890. However, the home production of sulphur pyrites which is already considerable (in the district of Bogoslovsk alone up to 3,000,000 pounds of pyrites were extracted and roasted, mainly for the extraction of its copper, the manufacture of sulphuric acid being only lately added to this industry at the works of Polovtsev), still increases, all the more so as, according to the customs tariff of 1891, sulphur pyrites and sulphur are subject to an inconsiderable duty, and is more and more employed in the manufacture of sulphuric acid, and indirectly of copper, as in the Urals. In 1890 the following amounts of pyrites were supplied exclusively for the manufacture of sulphuric acid: at the Urals, 358 thousand pounds; at the Sub-Moscow coal mines, 391 thousand pounds, for the Sub-Moscow sulphuric acid works; at Borovichi, from the river Msta, for the local sulphuric acid works, about 100 thousand pounds; while altogether, over a million pounds were registered by the Mining Department. Now, in 1892 to 1893, the production of pyrites for the manufacture of sulphuric acid must be counted as nearly twice that amount.

The chief producers of sulphuric acid are those works which provide it to the Artillery Department for the preparation of smokeless powder or pyroxyline, and those which use it themselves for different purposes, and especially for the preparation of sulphate of sodium, soda, and sulphate of alumina. Such are, for instance, the above-named works of Oushkov and Co. on the Kama near Elabouga, and the Tentelevsk works near St. Petersburg. In the district of Moscow there are up to 20 chambers for the preparation of sulphuric acid, chiefly for supplying the demands of neighbouring works. At Baku there are three works preparing concentrated acid for pur-

ifying the naphtha distillation products. In Poland, Kazan, Odessa, Kiev, and various other parts of Russia, as well as in St. Petersburg and Moscow, there are several sulphuric acid works, although the exact number of chambers is unknown, but it is not less than fifty; however, only a small number of these are of considerable dimensions, like those used at large chemical works. At many works the concentration of the acid is effected in platinum vessels, but the small works, and in some cases the larger, carry on the concentration in glass retorts. Many of the better works are furnished with the Gay-Lussac and Glover towers, so that in its qualitative aspect, the manufacture of sulphuric acid may already be considered as standing upon the basis of a technical and economical perfection, although there is still a lack of competition, which is seen from the fact that the price of acid concentrated to 93.5 per cent is rarely under 75 kopecks per pound. Nevertheless, the import of foreign sulphuric acid is small, for instance in 1890, not more than 51 thousand pounds of oil of vitriol, and under 11 thousand pounds of fuming acid, were imported.

The second most important branch of the chemical industry is the manufacture of caustic soda and carbonate of soda from common salt, by the Leblanc method or by the ammonia process. Now, both of these manufactures may be regarded as already established in Russia, although not long ago nearly all the soda required by the numerous industries using the salt, such as the naphtha industry and the soap manufacture, was imported. The import began to fall in the middle of the eighties, and was most marked in respect to carbonate of soda, which was produced in considerable quantities at Lubimov and Solvey's works situated at Beresniaki on the Kama, working with the ammonia process. But the import of caustic soda did not decrease. In 1890 over one million pounds, value at 2,333,333 million roubles, were imported. Nor did the import of bleaching powder and sulphate, 203,000 pounds in 1890, diminish, which clearly indicates the necessity of the creation of works for the production of soda by the Leblanc process, where caustic soda, bleaching powder, sulphate, and many other substances containing sodium and chlorine of common salt, can be simultaneously and conveniently produced. This evident want was satisfied by the works of Messrs. Oushkov and Co., also situated on the Kama. Thanks to the protective measures offered by the customs tariffs, and especially by that of 1891, the soda manufacture which forms the basis of the chemical industry is now firmly established, as is seen from the fact that since then Lubimov and Solvey have created a second large soda works for the manufacture of both carbonate and caustic soda in the Donetsk district near Lissichansk; and Messrs. Oushkov and Co. now turn out three hundred thousand pounds of caustic soda, and as much as two hundred and fifty thousand pounds of bleaching powder.

Besides the larger works, many of the smaller ones have started the manufacture of these most important products, so that in the near future the cessation of the foreign import, a revival of competition, a fall in prices, and even a foreign export may be looked for. It must, however, be acknowledged that the necessity of the manufacture of soda in Russia was long felt, but there were not the necessary economical conditions for it. It is true that in the seventies the salt destined for chemical treatment was freed from the excise of 30 kopecks to which it was then subject, but at that period, owing to the competition of the chemical works producing soda by the old Leblanc and the new ammonia processes, the price of soda and its products



were everywhere fluctuating; and there was such an over-production in Western Europe that the fall of prices was excessive, and the customs tariff only gave feeble help to the young Russian works in their struggle with the over-stocked European markets.

Soda was then only produced in small quantities in Russia, for example from the seaweed of the Caspian near Baku, or more frequently as a by-product in the manufacture of nitrate of potassium by the double decomposition of sodium nitrate and potash. Only in the depths of Siberia at Barnaoul, Mr. M. B. Prang took advantage of the native sulphate of sodium, which he converted into soda to supply an inconsiderable local demand. When in 1880 the excise dues were completely removed from salt, and protective duties were placed upon soda, and its cognates, it became possible for the Russian soda to compete with the foreign, but as this required the circulation of large capital, without which it was impossible to hope for success, so this competition did not commence before the close of the eighties. And now the result of this competition is visible in advance, because the imports are distinctly decreasing; for example, that of soda has fallen from 739 thousand pounds in 1890 to 440 thousand pounds in 1891, and of caustic soda and potash, from 1,043 thousand pounds in 1890, to 916 thousand pounds in 1891; while in 1892, for which there are no data beyond November, the proportion of the import has further fallen by about 200 thousand pounds a year, so that it can be asserted with great probability that the import will entirely cease after the space of ten years, and that after fifteen years Russia will be in a position to export soda, owing to the advantageous conditions which it possesses for this industry, especially near the shores of the Black Sea, where the Batalpashinsk lakes present a direct source of sulphate of sodium, and where the Donets coal basin offers an association of coal pyrites, rock salt, limestone, fire clay and manganese ore, that is, of all the most important raw materials necessary for a vast development of the chemical industry, and where the abundance of grain and cheap labour, and a direct sea route, give the sure possibility of competing with other countries. When once the industry has taken root, it will develop itself so rapidly that it will overstock the home markets, and require an external trade, just as was the case with the naphtha industry.

Among the most important chemical products, the third place is necessarily occupied by nitric acid and its products, especially those used in the preparation of gunpowder, such as nitre and the nitro-compounds. The fundamental material of nitre, or nitrate of potassium, was for a long time, and is even now, extracted from the nitre heaps in the south and east of Russia where, owing to the great fertility of the soil, the manure has no economical significance for fertilizing the fields. Native nitre occurs in the Caucasus, in Daghestan, and in the Transcaspian provinces, but it is only exploited on a small scale for local wants, and thus the import of sodium nitre from Peru and Chili gives the cheapest material. Its import into Russia is limited to from two to three hundred thousand pounds annually. It is mainly used for the preparation of potash nitre for ordinary black powder, or of nitric acid for the preparation of nitro-compounds for making smokeless powder. These manufactures are not only carried on by the Government and private powder mills, of which there are three each, but also by chemical works, all the more so as nitric acid, or *aqua fortis*, is used for many technical purposes.

One chemical works, which makes a specialty of the manufacture of potassium nitre and its products, has according to official data a yearly turnover of 524,000 roubles, and employs 55 workmen. Formerly, when the preparation of gunpowder was chiefly carried on with local nitre, there were as many as fifty small nitre works, which since 1878 have gradually ceased working. The conversion of sodium nitre into potassium nitre is done either with the Stassfurt potassium salts, of which 95,000 pouds were imported in 1890, or with Russian potash, chiefly prepared from the ash of grasses in the east of Russia. In former times, even in the beginning of the seventies, there were as many as 195 potash works in Russia producing material to the value of one million roubles, and potash used to be exported from Russia in considerable quantities; for instance, in 1870, 597,000 pouds were exported. Since the appearance of the Stassfurt potassium salts, however, the export has greatly fallen; in 1890, 45,000 pouds, value 137,000 roubles, were exported, and not more than 60 works with 300 workmen are occupied in the production of potash. These works turn out from 200,000 to 250,000 roubles worth of potash.

This decrease in the production of potash may be partly ascribed to the fact that now soda is generally employed in the place of potash. Potassium salts are only still required for the preparation of potash alums and of bichromate of potassium, and potash is now partly prepared for this purpose in Russia. But the demand for potassium salts for the manufacture of gunpowder, and for other purposes, becomes smaller and smaller. Thus nitre does not enter at all into the composition of smokeless powder, and sulphate of alumina is more and more employed in the place of potash alum; while either chromic anhydrite itself, or the sodium salt, is used instead of the potassium salt.

The last of the above named chemical products was established in Russia comparatively earlier than many other of the branches of the chemical industry; and this was because they were required for manufactures whose development precedes that of the chemical industry. In the fifties, alum began to be prepared from clays, by first treating them with sulphuric acid and then with potash, while in the Caucasus alum was prepared from the local native alumite and other alum minerals. In the seventies, and especially in the eighties, several works in Russia followed the example of the Tentelevsk works in St. Petersburg, and began to prepare both alum and sulphate of alumina from boxite brought from abroad. Thus the above mentioned works of Messrs. Oushkov and Co. produce annually up to 200,000 pouds of sulphate of alumina, and 100,000 pouds of alum. Both these substances are also prepared at many other Russian works.

There are vast deposits of chrome iron ore in the Urals, and formerly considerable quantities of this ore used to be exported from Russia, but now the American ore has supplanted the Russian in the markets of Western Europe. At the present time about 200,000 pouds of chrome iron ore are annually extracted in the Urals, and, thanks to a timely protective customs tariff, the conversion of the ore into bichromate of potassium has been established in Russia since the beginning of the fifties at the above mentioned works of Oushkov and Co., and is now carried on at other works, for instance at those of Mrs. Polovtsev in the Urals, so that the home production, amounting to about 70,000 pouds per year, almost satisfies the demand. The same may also be said with respect to the alumina products. In 1890, 6,250

pounds of chromate and 128,000 pounds of alumina compounds were imported. The internal production exceeds the import by several times.

Among the other chemical products used in manufactures, bleaching powder is particularly important. It has now found a further application in the extraction of gold by chemical processes. Up to recent times it was brought into Russia from abroad to the amount of about 400,000 pounds a year. Now, when the duty upon it has also been rendered more protective (according to the customs tariff of 1868 the duty was 40 kopecks per pound, while now it is 70 kopecks gold), there are several works producing up to 300,000 pounds annually, and the import is likely to decrease, although in 1892 it remained almost the same, owing to the increased demand proceeding from the gold mines of the Urals, for the treatment of the gold «schlich» in the wet way, which considerably increases the yield of gold. The cost of the production of bleaching powder is naturally chiefly dependent upon the cheapness of hydrochloric acid, and so far this has not been the case in Russia, although it has long been so in Western Europe, owing to the fact that this acid appears there as a by-product in the manufacture of soda by the Leblanc process, while in Russia soda is produced in considerable quantities by the ammonia process; therefore hydrochloric acid is still comparatively dear, and the demand for it is considerable, especially for the preparation of chloride of zinc, which is used for soaking railway ties. As regards the manganese ore required for the preparation of chlorine and bleaching powder, Russia abounds in a mass of excellent deposits in the Urals, Caucasus, and in the neighbourhood of the rapids of the Dnieper, which in 1892 yielded as much as eight million pounds of ore.

Among other chemical products mention should be made of the manufacture of acetic, tartaric, and gallic acids, which is carried on, and is progressing at many works, as well as that of soluble glass, of green and blue vitriol, sulphate of zinc, sulphuric ether, ethereal fruit essences, and all kinds of pharmaceutical extracts and preparations, including iodoform and chloroform. The latter are prepared at Keller's pharmaceutical works at Moscow, and at Pehl's laboratory in St. Petersburg, and others. But it is impossible to discuss these substances in detail from the want of accurate statistical data, and from want of space. In any case their production is dependent upon the degree of the development of the above mentioned larger chemical industries, which are only in their infancy and are still far from satisfying the growing Russian demand, as is seen from the fundamental data of the table on page 226. It must be said, however, that the natural sources and means of Russia are often applied to manufactures of a chemical character when the necessary initiative appears in a given circle of inhabitants.

Thus, when there was a large demand for it, the manufacture of yellow prussiate or ferrocyanide of potassium was widely distributed among the peasants of central Russia, in over a hundred localities, because it did not require much outlay for its installation, and the raw materials, leather scraps, horn and hoof cuttings, and wood ash, were at hand. The growing of mint, cumin, and aniseed, which was first carried on for domestic purposes, formed under the initiative of the apothecaries the basis of a large rural industry for the preparation of the volatile oils contained in these herbs, so that now Russia exports considerable quantities of these ethereal oils, especially to Germany. Still more instructive is the example of the so-called

*semen cinæ*, collected from the artemisia of the Orenburg and Turkestan steppes, and which was for a long time exported for the preparation of the well-known medicine «santonine». When the local inhabitants knew the object of the export and the considerable mass of santonine sent to China and other parts of Asia, they began to prepare it themselves, and now together with the seed they export an excellent preparation of santonine. Thus, in 1890, 612 pounds, including 57 of specially refined, were exported, to the value of 90,000 roubles.

The preparation of phosphorus, the materials for which in the form of bones and phosphorites abound in many parts of Russia, had an almost similar origin in Russia, and especially in the government of Perm. During the sixties and seventies, from two to four thousand pounds of phosphorus, to the value of 100 to 120 thousand roubles, were annually imported into Russia for the manufacture of matches. Now the import trade has almost ceased; in 1890, 198 pounds, valued at 7,000 roubles, were imported. On the contrary, an export trade has begun, which in 1890 amounted to 156 pounds, to the value of 47,000 roubles; this is due to the erection of several large and small works for the preparation of phosphorus; and, as is known, this is a manufacture which is rather complicated and requires a good deal of experience. At the present time safety matches made of red phosphorus predominate in Russia. They are manufactured within the Empire, and have already found a market abroad. It should be mentioned here that the production of phosphorus in Russia was instigated in 1868 by a high protective duty of 10 roubles gold per pound. The customs tariff of 1891 raised this duty to 11 roubles, and, as has been already mentioned, protective duties have only been recently placed on the majority of other chemical products.

Russia is chiefly supplied with cosmetics by the works of Moscow, St. Petersburg, Warsaw, Odessa, and the districts lying around these cities. In 1890 there were altogether twenty-six such works, with a production of three million roubles worth of goods. The foreign import has long been limited to about 500,000 roubles, which shows that the home industry is sufficiently developed. And here it may be well to mention that the import of glycerine which has many other applications besides that of a cosmetic, has already given place to an export trade, and that it is prepared at several works in Russia, and notably at those of Krestovnikov in Kazan, where the purification of glycerine by distillation and systematical crystallization is carried on to such a degree that the product may be regarded as being as pure as possible, as the author found to be the case by investigations made by himself. It is not surprising that such a product should be exported, although there is a small import trade going on all the same.

Among the dyes and colouring matters it is necessary to distinguish the natural from the artificial, and the mineral from the organic. Of the natural organic dyes the most important are those which are produced in the tropics, because they are employed in large quantities for dyeing tissues. They form the object of a large import trade over all Europe, and Russia annually imports from 50,000 to 60,000 pounds of indigo, value six to seven million roubles; from 1,500,000 to 2,500,000 pounds of campeachy, sandal, log, and other woods, value 1,500,000 to 2,500,000 roubles; cashoo or catechu from 150,000 to 200,000 pounds, value 500,000 to 600,000 roubles; cochineal 3,000 to 5,000 pounds, value about 100,000 roubles; and various other dyes of

this class, such as turmeric, orsellic, luteolin, kermes seed et cetera, to the amount of 100,000 to 200,000 pounds, and valued at eight to ten million roubles.

In the forties and sixties the cultivation and export of madder roots from the Caucasus, and especially from Derbent, formed one of the Russian industries, but since the introduction of the artificial alizarine it has quite declined. Endeavours have been made to cultivate indigo wood, and other dye-producing plants in the warm Asiatic districts of Russia, but they were few and carried on with insufficient perseverance. This import trade gives occupation to many works for the preparation of the extracts of the wood dyes used in the arts.

As regards the artificial hydrocarbon dyes, and notably alizarine and those derived from coal tar, although they are used in considerable quantities in Russia as elsewhere, still their preparation has only been taken up as an experiment, because the insufficient development of the coal tar distillation and of the manufacture of many of the chemicals required, does not yet permit the young Russian industry to enter into competition with the German and French producers of these artificial pigments. Almost all that has been done in this direction consists in the working up of the nearly finished article, such as anthracene or alizarine brought from abroad, into the form in which it is used by the dyer, for example of alizarine into a paste containing 10 to 20 per cent. A more serious progress in this industry can only be looked for when the treatment of coal tar and naphtha refuse itself is better established in Russia. When the naphtha refuse is subjected to dry distillation for the preparation of lighting gas, a tar is obtained containing as large an amount of benzole and anthracene as coal tar, as is seen from the researches of Letnyi, Schmidt and others. But the treatment of this tar is not yet on a large scale, although the manufacture of lighting gas from the refuse is widely spread over Russia. The import of artificial coal tar pigments proceeds chiefly from Germany, and amounts yearly, as in 1890 and 1891, to 50,000 pounds, value 3,000,000 roubles. The greater part of this amount goes to the so-called finishing works, and therefore their turnover is estimated at about 2,500,000 million roubles, including sulpho-salts of the naphthalin series imported for the preparation of the azodyes, which are now much used in dyeing. Some of these factories in Moscow are branch establishments of German works. In Poland there is an independent works for the preparation of these pigments. Thus the manufacture of neither the hydrocarbon organic dyes, nor the natural or artificial dyes, is yet firmly established in Russia.

The manufacture of the mineral pigments is more developed, and in Russia they are now prepared both from natural coloured clays, and from other minerals such as chalk, baryta, hematite, lapis lazuli, et cetera, and especially from iron; for instance, colcothar from pyrites and vitriol; copper, for example, the green roofing paint from carbonate of copper, and from verdigris; lead, for instance, white lead and chrome yellow and zinc compounds, as zinc white. Ochres and other similar pigments and ferruginous clays are met with in abundance in many parts of Russia and they are now used at many works for the preparation of paints for walls, floors, and the like. The manufacture of white lead has made particular progress in the interior of Russia, where according to official data as much as 250,000 pounds to the value of 850,000 roubles are prepared annually. About 120,000 pounds of white lead are brought from abroad. Both the Russian and the imported white lead con-

tain a mixture of baryta. Although red lead is manufactured at several Russian works, it is now annually imported to the amount of about 100,000 pounds. Up to 20,000 pounds of copper pigments, including verdigris, are imported, and about 10,000 pounds manufactured in Russia. The same may be said of the blue mineral colours, such as ultramarine, Prussian blue et cetera. They are already prepared in Russia, but their manufacture does not advance sufficiently fast, so that there is a simultaneous import trade in these materials. It is the same with the preparation of blacks, blacking, ink, and ground paints.

The commencement of these industries already exists in Russia, but the demand exceeds the production, and this is especially the case with the better sorts of pigments. The total value of the home production of mineral pigments, both natural and artificial, is twice that of the imported, so that here also the home manufacture has succeeded in making comparative progress with what it was not long ago; and the same may be said with respect to the manufacture of the organic hydrocarbon pigments, both natural and artificial. The manufacture of pigments is centred in the governments of Moscow and St. Petersburg, in Poland, and in the south and east of Russia.

The above data show that the home production of chemical and dye goods is still far from satisfying the growing demand, and that many branches require further development. However, the beginning of this development has already taken place; and as the customs tariff of 1891 has given a distinct although not excessive protection to these industries, as they have thereby made noticeable progress notwithstanding the short time since its improvement, it may be hoped that the home chemical and pigment manufactures will now move in the right direction, that is, that the foreign goods will gradually give way to the home products, as they have done in many other branches of industry, for instance, the manufactures of cotton goods and glass. And when with the help of protective duties the industry gains strength, then an export trade if not of all, at all events of many chemical products may be expected, just as it is with the manufactures which have long been the object of a protective system, for example, the naphtha industry (Chapter XV), the sugar industry (Chapter XVII), and even the india-rubber manufacture (Chapter VII), and some chemical goods, such as phosphorus (Chapter XIII).

#### THE MANUFACTURE OF ILLUMINATING GAS.

Owing to want of time certain of the articles upon the Russian technical industries were not prepared in time for the edition destined for the Columbian Exposition. In the case of one of these, gas manufacture, it was thought best to give a few general data extracted from Mr. S. J. Lamansky's article, because this manufacture is so intimately connected with the chemical industries.

The majority of Russian towns, mills, and works, are lighted by kerosene lamps; but in many cases gas and electricity are also used, although owing to the cheapness of kerosene they are not able to compete with the latter in respect to cost. In lighting with kerosene a well constructed lamp consumes not more than three and one-half grammes of oil per candle-power per hour; so that if the price per pound or 16,380

grammes be taken at one rouble, then 1,000 candles per hour will cost 22 kopecks. In the case of gas, 1,000 candles per hour require the consumption of not less than 330 cubic feet of gas, which even at the low price of 50 kopecks per thousand cubic feet costs at least twice as dear as kerosene. Moreover, in recent times the extension of gas illumination has been hindered by the introduction of electric lighting, which is now not only applied to many works and mills already furnished with motors, but at those having special, and notably, kerosene motors, which are very considerably used in Russia. Electric lighting has for a long time been used even in many mines, for instance, in the salt mines of the Donets district. The cheapness of kerosene, and the many advantages of electric light, have caused the manufacture of lighting gas to be but little extended in Russia, although there are excellent materials for its manufacture in the form of many of the Donets coals and particularly of those to the south of Lissichansk, and of the Riazan bog-head, or the naphtha refuse (Chapter XV). Water gas and Dawson's gas have been tried in Russia but as yet they are scarcely used.

Thirty towns in Russia are lighted by gas; twenty-two of them produce about 2,000 million cubic feet (about 56 million cubic metres) of illuminating, and in the majority of cases, coal gas. Kiev is lighted by a mixture of wood and naphtha gas, Vilna by wood gas, Kazan and Yalta by naphtha gas. Besides these thirty towns, Mr. Reyn in a paper read before the St. Petersburg Technical Society enumerated 157 gas works adjoining various mills and 23 gas works of various railway stations. The majority of the small gas works extract their gas from naphtha refuse. This gas is known to be very dense owing to its containing numerous heavy hydrocarbons, and its manufacture in Russia is carried on very easily and simply. The largest gas works are in St. Petersburg, where about 20,000,000 cubic metres are consumed annually. Here, a certain portion of the gas is consumed in gas motors, which, however, are now being gradually replaced by kerosene motors.



## CHAPTER XIV.

## Manufacture of matches.

**T**HE manufacture of matches having a head of smelted sulphur, *sernichki*, in Russia dates from the most ancient times. They were used in the kindling of the fires, for which purpose the match was touched to a burning coal taken from a heap of embers which had been covered in the *sagnotok*, (a cavity of the oven); they were also used when fire was struck by means of the steel, flint, and tinder. Owing to the fact that sulphur is easily ignitable, it was used for a long time in the making of phosphorous matches, their ends being first covered with sulphur and then with phosphorus. Therefore, matches are until now called *serenki* (made of sulphur) by the Russian peasants.

The manufacture of phosphorous matches had been established in Russia already before 1840, but its dimensions were for a long time very limited, partly because the bulk of the Russian people continued to use the flint and tinder for striking a light, and partly because the manufacture, as well as the use of phosphorous matches, was subject to very restraining regulations. Only since the demand for matches increased, and especially since 1859, when a law was issued allowing their manufacture without any special restraints to follow the regulations concerning the establishment of factories and free trade with the products, did the production begin to grow.

This increase, however, did not relate to the number of factories, which was subject to many fluctuations, as much as to the dimensions of the output. Thus, for the period from 1865 to 1887, the average number and the product of the match factories in European Russia, Poland excluded, were as follows:

| Y E A R S.          | AVERAGE NUMBER<br>OF FACTORIES. | AVERAGE VALUE OF THE<br>OUTPUT IN ROUBLES. |
|---------------------|---------------------------------|--|
| 1865—1867 . . . . . | 80                              | 434,000                                    |
| 1868—1872 . . . . . | 136                             | 700,000                                    |
| 1873—1877 . . . . . | 202                             | 1,212,000                                  |
| 1878—1882 . . . . . | 230                             | 1,784,000                                  |
| 1883—1887 . . . . . | 210                             | 2,272,000                                  |



The above data show the great increase in the output of the Russian match factories. If the total product be compared with the number of factories, it will be seen that each factory had an average yearly output of 5,000 roubles, in the period 1865 to 1872; 6,000 roubles, in 1873 to 1877; 7,760 roubles, in 1878 to 1882; and 10,800 roubles, in 1883 to 1887. It should be mentioned, however, that only factories having a yearly output not under 1,000 roubles are included in these figures, while in addition to such establishments there was a great number of small works bearing the character of the Russian household industry, with a varying output of a few hundred roubles. According to the data collected in 1887 by the Ministry of Finance the number of establishments manufacturing matches amounted, for European Russia alone, to 337, while the data referring to the factories with a yearly output of not less than 1,000 roubles give their number as only 197. At first the manufacture of matches at the works and small household factories was of a primitive character. The greater part of such works exclusively used ordinary yellow or white phosphorus, and the production was under very poor sanitary conditions, in as much as the workmen were in no way protected from the phosphorous fumes.

With regard to technic the greatest improvement, made at the first stage of growth, namely, in the sixties, was the diminution in the percentage of phosphorus as a component part of the mass, called forth both by the expense and by the poisonous nature of the material. At first, 7 pounds of white phosphorous were used per 1,000 matches, and in the beginning of the sixties, at the best works, only 3 to 4 pounds were used per thousand. Later on, the so-called Swedish, or safety matches, lighted by rubbing against a surface covered with red or amorphous phosphorus, came into use. The first of the works producing such matches was established in Finland on the island Starsand near Björneborg, and in 1860 the first supply of such matches was brought from there to St. Petersburg. In the seventies some of the Russian factories began the work, but even in the eighties their number was not large, in fact it was limited to 6 or 7 factories.

To the improvements made in the production of matches of white phosphorus must be reckoned the means of protecting their heads from moisture by covering them with varnish and other cheaper compounds, introduced at some works already in the sixties, as well as the setting aside of sulphur, and the impregnation of the wood with stearine, paraffin, and the like, in order to avoid the development of caustic gases on ignition. For preventing the match from smouldering after the flame had been extinguished, the wood was impregnated with such compounds as would lessen the inflammability, and at the same time render the match proof against smouldering, for instance, with borax, phosphureted salts, et cetera. The introduction of machinery for preparing the match sticks must be reckoned also among the technical improvements of the manufacture; however, many of the factories are still employing hand labour for the purpose, and prepare the sticks at the factories, or give the work out to special workmen.

As to the organization of the factories with regard to hygienic measures, improvements were a rare exception until lately, the greater part of the factories establishing only regularly working draft chimneys; therefore the workmen at the match factories using white phosphorus were always subjected to great risks. The disease engendered under such unhealthful conditions is a chronic or slow phosphorus pois-

oning, the first symptoms of which are loss of flesh, with a yellowish skin, followed by pains in the stomach, debility and trembling of the limbs, palpitation of the heart, and like affections; in some cases diseases of the breathing organs are noticed, but the worst consequences of phosphorus poisoning are inflammation of the lungs, and gangrene of the maxillary bones.

In view of the above mentioned unfavourable hygienic conditions in which the match factories are placed by the very nature of their method of manufacture, when in 1887 the question of the instalment of a tax upon matches arose, and a special conference at the Ministry of Finance for the deliberation of the proposition was organized, the conclusion was reached that such a tax was highly desirable, especially from the hygienic and sanitary points of view, as likely to bring about an improvement in the organization of the factories and in the conditions of the work in them. In order to further such improvements, and to prevent the opening of factories too small to be able to answer all the sanitary and hygienic requirements, the rule was laid down that the existing match factories should use band labels to the value of 1,500 roubles, and the newly established works, to the value of 3,000 roubles. Moreover the conditions were made obligatory to every factory, that it should have the following principal premises: 1. a separate storehouse for the keeping of phosphorus, sulphur, Bertholet's salt, and paraffin; 2. a section for the preparation of the phosphureted mass, and the dipping therein of the match ends; 3. another house for the packing of matches and the putting of the band labels on the boxes; 4. a separate storehouse for the keeping of the packed but not yet labelled boxes.

When on January 4, 1888, the law was issued ordering an excise to be levied on matches, and was put into force from May 1, the production of matches entered upon a new period of existence; although, owing to the above mentioned exactions with regard to the organization of the factories, some of them closed their doors, the production, however, grew to be more regular, and the quality of the products, as well as the sanitary and hygienic conditions of the work, greatly improved. In 1887 there were in all 360 match factories; in 1888, after the instalment of the excise, their number decreased to 278.

The table on the following page shows in what regions the number of such factories has mostly decreased. From the same data it may be seen that the general decrease of the number of match factories in 1888 as compared to 1887 was about 23 per cent.

Of the 278 establishments making matches in 1888 the greater part, namely 233, or 80.2 per cent, were producing phosphorous matches, the number of those making them without phosphorus being only 17, or 6.1 per cent; 38 factories, or 13.7 per cent, making both kinds of matches. The total output of all the match manufacturing factories amounted in 1888 to 59,355,325,000 pieces. This quantity comprised, however, only those produced after the instalment on May 1, 1888, of the excise; but when the total stock stored up in the several trade establishments was reckoned on June 11, 1888, the amount of such matches in the whole Empire was found to be 24,036,646,000 pieces.

Of the matches produced since May 1, at the 278 factories at work in 1888, the quantity of which is mentioned above, 77.5 per cent fell to simple phosphorous matches, and 22.5 per cent to non-phosphorous, the central manufacturing govern-

| G O V E R N M E N T S .   | NUMBER OF MATCH FACTORIES. |          | In 1888 less. |
|---|----------------------------|----------|---------------|
|   | In 1887.                   | In 1888. |               |
| The northern (Archangel, Vologda, Novgorod, Olonets, Pskov) . . . . .                                       | 26                         | 21       | 5             |
| The eastern (Viatka, Kazan, Perm, Samara, Ufa) . . . . .  | 75                         | 55       | 20            |
| The central manufacturing (Vladimir, Kaluga, Kostroma, Nizhni-Novgorod, Smolensk, Tver, Yaroslav) . . . . . | 63                         | 52       | 11            |
| The central Chernoziom (Kursk, Orel, Penza, Riazan, Saratov, Simbirsk, Tambov) . . . . .                    | 109                        | 79       | 30            |
| Little Russia (Poltava, Kharkov, Chernigov) . . . . .   | 14                         | 11       | 3             |
| The Baltic (Courland, Livonia, Esthonia) . . . . .  | 11                         | 9        | 2             |
| The north-western (Vilna, Vitebsk, Grodno, Kovno, Minsk, Moghilev) . . . . .                                | 25                         | 17       | 8             |
| The south-western (Volyn, Kiev, Podolsk) . . . . .  | 3                          | 2        | 1             |
| Poland . . . . .  | 12                         | 11       | 1             |
| Transcaucasia . . . . .   | 1                          | —        | 1             |
| Total . . . . .   | 339                        | 257      | 82            |

ments producing the greater part of the former, (13,725,360,000) and the northern governments, the greater part of the latter, (5,610,586,000). Phosphorus, being one of the principal materials used in the manufacture, is worked to a sufficient extent in Russia itself. During the period from 1889 to 1890 there were ten factories for the production of phosphorus, nearly all of them centred in the eastern and northern regions, one only being in the western part of Siberia, in Tumen; their total yield of phosphorus reached 11,386 pounds, including 10,740 pounds, 94.4 per cent. of white, and 646 pounds, 5.6 per cent, of red phosphorus.

The distribution of the product was as shown in the following table.

| GOVERNMENTS OF :   | NUMBER OF FACTORIES. | QUANTITY OF PHOSPHORUS PRODUCED. |      |          |
|--------------------|----------------------|----------------------------------|------|----------|
|                    |                      | White.                           | Red. | Total.   |
| P o u n d s .      |                      |                                  |      |          |
| Vologda . . . . .  | 1                    | 697                              | 4    | 701      |
| Novgorod . . . . . | 1                    | 140.6                            | —    | 140.6    |
| Perm . . . . .     | 6                    | 9,808                            | 642  | 10,450   |
| Vladimir . . . . . | 1                    | 4                                | —    | 4        |
| Kaluga . . . . .   | 1                    | 91                               | —    | 91       |
| Total . . . . .    | 10                   | 10,740.6                         | 646  | 11,386.6 |

Thus, the government of Perm is the principal centre of the phosphorous works with the largest output of red and white phosphorus, their number being 6, with an average yield of 10,450 pounds, forming 91.8 per cent of the whole product of Russia.

Phosphorus is sold in Russia either by wholesale, or in apothecary shops by retail. The principal stores for phosphorus are in the governments of Moscow, Nizhni-Novgorod, Viatka, Perm, St. Petersburg, Livonia, Vilna, Kherson, Kharkov, Chernigov, and Warsaw. The prices for the material are not high, namely, from 28 to 41 roubles for white, and from 40 to 62 roubles for red phosphorus per pound. The quantity produced in Russia not only supplies the home requirements, but a considerable amount is exported. Thus, the export was as follows:

|               |            |               |              |
|---------------|------------|---------------|--------------|
| In 1885 . . . | 237 pounds | In 1888 . . . | 3,699 pounds |
| > 1886 . . .  | 1,021   >  | > 1889 . . .  | 3,150   >    |
| > 1887 . . .  | 1,958   >  |               |              |

The import of phosphorus into Russia is subject to many fluctuations, but on the whole it is decreasing, as seen from the following figures:

|               |              |               |            |
|---------------|--------------|---------------|------------|
| In 1885 . . . | 3,890 pounds | In 1888 . . . | 985 pounds |
| > 1886 . . .  | 753   >      | > 1889 . . .  | 189   >    |
| > 1887 . . .  | 1,342   >    |               |            |

The match sticks are either made at the factories themselves or given out to be worked by *koustars*, who very often make the packing boxes also. For this purpose aspen wood is chiefly employed, it being very porous, and unsuitable for more expensive uses. Lately some of the works situated in the ports prepare considerable quantities of sticks for export.

The temporary decrease in the manufacture of matches, due to the instalment in 1888 of the excise thereon, was followed by a new development of the industry. In 1889 the number of factories reached 312, and the average output increased also, which in 1888 owing to the closing of some of the works and the delay in the opening of those that survived, as well as to the large stock of matches on hand before the introduction of the excise, had somewhat decreased. However, in 1890 and 1891, the number of the factories again decreased, but the dimensions of the output grew considerably, especially the making of matches without phosphorus, for which special works were organized. The following data give an idea of the comparative number of match factories and their output for the years from 1888 to 1891.

| YEARS.    | NUMBER OF FACTORIES. |                           |                |        | QUANTITY OF MATCHES PRODUCED<br>IN THOUSANDS. |                      |             |
|-----------|----------------------|---------------------------|----------------|--------|---|----------------------|-------------|
|           | Phos-<br>phorous.    | Non-<br>phos-<br>phorous. | Both<br>kinds. | Total. | Phosphorous.                                  | Non-<br>prosphorous. | Total.      |
| 1888. . . | 223                  | 17                        | 38             | 278    | 45,985,711                                    | 13,369,614           | 59,355,325  |
| 1889. . . | 240                  | 20                        | 52             | 312    | 111,719,366                                   | 27,984,361           | 139,703,727 |
| 1890. . . | 200                  | 20                        | 70             | 290    | 108,258,303                                   | 34,590,970           | 142,849,273 |
| 1891. . . | 189                  | 25                        | 57             | 271    | 106,902,912                                   | 37,844,413           | 144,747,325 |

These data show that since the instalment of the excise upon matches their production in Russia tends visibly to increase. The number of factories making phosphorous matches has decreased; those having a mixed product have fluctuated considerably in number, but those making safety matches have increased in number and in output, at the expense of those manufacturing simple phosphorous matches. Thus, in 1890 the output of safety matches in comparison to that of 1889 had increased 23.6 per cent; in 1891 as compared to 1890, 9.4 per cent; in the mean time the making of phosphorous matches had decreased in 1890, 3.1 per cent; and in 1891, 1.3 per cent. The average product of the factories grew accordingly; in 1889, it reached 447,700,000; in 1890, 492,500,000; and in 1891, 534,100,000 pieces.

The match factories were distributed in different regions for the last three years as follows:

| G O V E R N M E N T S.              | NUMBER OF FACTORIES. |          |          |
|-------------------------------------|----------------------|----------|----------|
|                                     | In 1889.             | In 1890. | In 1891. |
| Eastern . . . . .                   | 61                   | 62       | 62       |
| Central Chernoziom . . . . .        | 86                   | 71       | 61       |
| Central manufacturing . . . . .     | 59                   | 53       | 52       |
| Northern . . . . .                  | 24                   | 24       | 21       |
| North-western . . . . .             | 19                   | 17       | 16       |
| Little Russia . . . . .             | 13                   | 14       | 14       |
| Poland . . . . .                    | 11                   | 13       | 12       |
| Baltic . . . . .                    | 10                   | 11       | 9        |
| St. Petersburg and Moscow . . . . . | 10                   | 8        | 6        |
| Western Siberia . . . . .           | 7                    | 6        | 6        |
| Eastern Siberia . . . . .           | 4                    | 3        | 2        |
| Southern . . . . .                  | 4                    | 4        | 4        |
| South-western . . . . .             | 3                    | 3        | 4        |
| Turkestan . . . . .                 | 1                    | 1        | 1        |
| Transcaucasia . . . . .             | —                    | —        | 1        |
| Total . . . . .                     | 312                  | 290      | 271      |

From these figures it may be seen that the greatest number of the factories in 1891 were in the eastern region, namely 22.9 per cent, while in the two preceding years the first place was held by the central Chernoziom region; in 1890, 24.5 per cent, in 1889, 27.5 per cent, which is now second, 22.5 per cent. Other regions come in successive order as follows: central manufacturing, 19.2 per cent;

northern, 7.7 per cent; north-western, 5.9 per cent; Little Russia, 5.2 per cent; Poland, 4.4 per cent, et cetera. In 1891 one factory was established in Transcaucasia, where until then no such works had existed.

The distribution of the match factories of different categories in 1891 in the various regions is seen from the following figures.

| G O V E R N M E N T S .             | N U M B E R O F F A C T O R I E S . |                   |             |        |
|-------------------------------------|-------------------------------------|-------------------|-------------|--------|
|                                     | Phosphor-ous.                       | Non-phosphor-ous. | Both kinds. | Total. |
| Eastern . . . . .                   | 44                                  | 1                 | 17          | 62     |
| Central Chernoziom . . . . .        | 55                                  | 1                 | 5           | 61     |
| Central manufacturing . . . . .     | 41                                  | —                 | 11          | 52     |
| Northern . . . . .                  | 11                                  | 6                 | 4           | 21     |
| North-western. . . . .              | 10                                  | 1                 | 5           | 16     |
| Little Russia . . . . .             | 9                                   | 3                 | 2           | 14     |
| Poland . . . . .                    | 5                                   | 1                 | 6           | 12     |
| Baltic . . . . .                    | 2                                   | 5                 | 2           | 9      |
| St. Petersburg and Moscow . . . . . | 3                                   | 2                 | 1           | 6      |
| Western Siberia . . . . .           | 4                                   | —                 | 2           | 6      |
| Southern . . . . .                  | 2                                   | 1                 | 1           | 4      |
| Eastern Siberia . . . . .           | 1                                   | 1                 | —           | 2      |
| South-western. . . . .              | 2                                   | 2                 | —           | 4      |
| Turkestan . . . . .                 | —                                   | —                 | —           | 1      |
| Transcaucasia. . . . .              | —                                   | 1                 | —           | 1      |
| Total . . .                         | 189                                 | 25                | 57          | 271    |

It follows, therefore, that in 1891 the number of the factories producing simple matches formed 69.8 per cent; safety matches, 9.2 per cent; and both kinds, 21 per cent; while the former method included in 1890, 69 per cent, and in 1889, 77 per cent; the second, 6.9 per cent, in 1890, and 5.4 per cent, in 1889; and the third, 24.1 per cent in 1890, and 17.6 per cent in 1889.

The greatest part of the works making safety matches falls to the northern governments, then follow the Baltic, Little Russia, St. Petersburg and Moscow, south-western and others. The factories having a mixed production are mostly spread in the eastern region, after which come the central manufacturing, Poland, central Chernoziom, north-western, northern and others. The successive order of the regions according to the amount of their output may be seen from the following table.

| GOVERNMENTS.                          | THE QUANTITY OF PHOSPHORUS USED AND THAT OF MATCHES<br>IN THOUSANDS. |                       |  |                       |  |                       |
|---------------------------------------|--|-----------------------|--|-----------------------|--|-----------------------|
|                                       | 1889.  |                       | 1890.  |                       | 1891.  |                       |
|                                       | Quantity<br>of phos-<br>phorus<br>in pounds.                         | Number of<br>matches. | Quantity<br>of phos-<br>phorus<br>in pounds. | Number of<br>matches. | Quantity<br>of phos-<br>phorus<br>in pounds. | Number of<br>matches. |
| Central manufactur-<br>ing. . . . .   | 2,262.5  | 32,745,123            | 2,327.7                                      | 31,357,844            | 2,111.9                                      | 30,020,817            |
| Eastern. . . . .                      | 1,471  | 20,226,701            | 1,470.6                                      | 25,305,062            | 1,732.1                                      | 26,139,679            |
| Central Chernoziom.                   | 1,194.7  | 20,419,084            | 1,485  | 20,343,306            | 1,223.4                                      | 21,460,593            |
| Northern . . . . .                    | 631.4  | 18,784,487            | 454.3  | 19,335,824            | 370.1  | 18,344,398            |
| Little Russia . . . .                 | 1,165.7  | 20,698,706            | 875.6  | 19,657,503            | 813.3  | 18,314,436            |
| North-western. . . .                  | 284  | 8,551,542             | 420.5  | 8,812,066             | 420.1  | 9,209,932             |
| Baltic . . . . .                      | 105  | 4,771,830             | 118.8  | 5,219,244             | 351  | 5,443,068             |
| Poland . . . . .                      | 174.1  | 4,127,567             | 157.2  | 4,536,845             | 178.3  | 4,556,426             |
| Western-Siberia . . .                 | 384.2  | 2,918,888             | 137.3  | 2,765,027             | 249  | 3,651,543             |
| Southern . . . . .                    | 243.1  | 3,628,882             | 192.5  | 3,258,905             | 176.1  | 3,002,876             |
| St. Petersburg and<br>Moscow. . . . . | 90.8   | 1,969,809             | 63.4   | 1,543,750             | 57.8   | 2,452,830             |
| South-western. . . .                  | 21.2   | 474,525               | 20   | 208,218               | 26.5   | 857,296               |
| Turkestan. . . . .                    | 28.3   | 141,615               | 51.6   | 223,857               | 40.7   | 317,871               |
| Eastern-Siberia . . .                 | 49.2   | 514,963               | —  | 281,822               | 12.8   | 312,624               |
| Transcaucasia. . . .                  | —  | —                     | —  | —                     | 18   | 123,477               |
| Total . . . . .                       | 8,125.2  | 139,703,728           | 7,774.5                                      | 142,849,278           | 7,781.6                                      | 144,747,325           |

These figures show that the production has lately centred chiefly in the different regions as follows: central manufacturing, 20.8 per cent of the total output of the Empire; eastern, 18.4 per cent; central Chernoziom, 14.8 per cent; northern, 12.7 per cent; and Little Russia, 12.6; all the other regions together, 20.7 per cent.

According to the average amount of the output, which in 1891 reached 534,123 thousand pieces in the Empire, the order for the different regions was as follows, the factories of Little Russia having the largest production: in 1889, 1,592,208,000; in 1890, 1,404,108,000; and in 1891, 1,308,174,000 pieces; then followed, in 1889 and 1890, those of the southern region, 970,220,000 and 814,726,000 pieces; and in 1891, those of the northern region, 873,543,000; in 1889 and 1890, 782,686,000 and 805,659,000; then again in 1891, those of the southern region, 750,719,000 and so on. The smallest output fell in 1889 to the factories of eastern Siberia, 128,741,000; in 1890 to those of the south-western region, 69,406,000; and in 1891 to that situated in Transcaucasia, 123,477,000.

With regard to the kind of matches made (phosphorous and safety matches) the first place in the making of simple phosphorous matches must be allotted for all

three succeeding years to the central manufacturing region (in 1889, 30,440,339 thousand; in 1890, 27,614,887 thousand; in 1891, 26,907,125 thousand): next came the regions, eastern, central Chernoziom, and Little Russia (from 24,738,870 to 15,628,365 thousand); the north-western (5,067,323 to 6,596,620 thousand), et cetera. The smallest production was in 1889 in Turkestan (130,813 thousand); and in 1890 and 1891, in the south-western region (118,009 to 38,588 thousand). Safety matches were chiefly produced in the northern region (1889, 14,731,463 thousand; in 1890, 15,413,126 thousand, and in 1891, 14,461,296 thousand); the Baltic (in 1889, 3,578,701 thousand; in 1890, 4,334,518 thousand; in 1891, 4,726,745 thousand); the north-western and central manufacturing (from 1,954,922 to 4,142,609 thousand), et cetera. The least output was in Turkestan (in 1890, 4,265,000; in 1891, 10,226,000; and in 1889, 10,801,000).

Besides simple phosphorous and safety (non-phosphorous) matches, Bengalese matches have been lately manufactured in Russia, their output being, however, very insignificant. According to the data of 1891, 13 factories were engaged in this branch of the industry, producing on the average 1,746,000 boxes of matches containing each from 15 to 75 pieces. As the making of this kind of matches proved to be injurious, a law was issued November 16, 1892, forbidding its further manufacture.

According to the regulations of January 4, 1888, and May 9, 1889, the taxes levied on matches are: 1. the excise collected from the band labels on the boxes 2. the license duties granting the right to establish match factories.

The excise upon the matches produced in Russia is: 1. a quarter of a kopeck per box containing not more than 75 matches; 2. half a kopeck per box containing from 75 to 150; three-quarters of a kopeck per box containing from 150 to 225; and one kopeck per box containing from 225 to 300 matches. The duties on the imported matches, notwithstanding the customs duty levied thereon, is double the above-mentioned. According to the law of November 16, 1892, the excise on phosphorous matches is twice as large as that on safety matches.

The license duties are: 1. for factories with hand machines, 50 roubles per year; 2. for those having horse motors, 100 roubles; 3. for those moved by steam engines, 150 roubles.





## CHAPTER XV.

## The Naphtha Industry.

THE exploitation and treatment of naphtha gives an instance of the rapidity which mining and industrial enterprise can attain in Russia, if only the combined circumstances be favourable. In giving a concise description of this industry, which has already been partially treated in the volume upon the Mining and Metallurgical industries, it is first necessary to mention that the exploitation of raw naphtha is mainly concentrated on the Apsheron peninsula near Baku, although it is also carried on, but in a far smaller extent, on the Cuban, in the province of Tersk, and other localities. There are signs of the occurrence of naphtha in many other parts of Russia besides the Caucasus, but the majority of these localities have not yet been exploited, or even sufficiently surveyed.

The statistical data of the production of naphtha in past years, especially before the seventies, are not reliable; and in the more recent data, especially since the yearly appearance of numerous naphtha fountains from the sinking of wells, there are doubtful figures reaching to as much as several million pouds. In the fifties the production did not exceed 300,000 pouds, and was not under 150,000 pouds. In 1860 to 1865 it varied between 300,000 and 800,000 pouds, and in 1865 to 1870, between one and two million pouds per year. Therefore the author only gives the data of the production in millions of pouds, all the more as even in recent years, when the data are collected both by the representatives of the mining and excise offices, and by persons elected at the meetings of the naphtha traders, the estimates from different sources often differ by whole millions of pouds. Moreover, for facilitating comparison, the author adjoins the data for the production, expressed in American barrels, taking the capacity of a barrel at forty gallons. As the weight of a gallon of water is equal to 0.277 Russian pouds, therefore a barrel will hold 11.08 pouds of water, and as the density of the chief mass of the Apsheron naphtha is about 0.875, it may be said that a barrel contains on the average 9.7 pouds of naphtha; and this is the figure taken by the author for expressing the production in barrels.

The density of the American naphtha is less, and frequently only 0.82. In that case a barrel of 40 gallons would weigh 9.0 pounds. This is the figure taken for converting the barrels of American naphtha into pounds. As an example the author cites the production of naphtha in the United States in pounds, according to «Stowel's Petroleum Reporter». The legal barrel of 40 gallons is taken, and not of 42 gallons, which Stowel takes.

| YEARS.        | POUNDS.       | BARRELS.   |
|---------------|---------------|------------|
| 1875. . . . . | 85,000,000 =  | 9,500,000  |
| 1880. . . . . | 149,000,000 = | 16,500,000 |
| 1885. . . . . | 224,000,000 = | 25,000,000 |
| 1891. . . . . | 331,000,000 = | 36,500,000 |

The following table gives the amount of naphtha obtained in Russia during the last twenty-two years, expressed in millions of pounds and millions of barrels.

| YEARS.         | Million pounds.               | Million barrels. | YEARS.         | Million pounds. | Million barrels. | YEARS.         | Million pounds. | Million barrels. |
|----------------|-------------------------------|------------------|----------------|-----------------|------------------|----------------|-----------------|------------------|
| 1870 . . . . . | 1 <sup>3</sup> / <sub>4</sub> | 0.2              | 1877 . . . . . | 14              | 1.4              | 1884 . . . . . | 90              | 9.3              |
| 1871 . . . . . | 2                             | 0.2              | 1878 . . . . . | 22              | 2.3              | 1885 . . . . . | 116             | 12               |
| 1872 . . . . . | 3                             | 0.3              | 1879 . . . . . | 25              | 2.6              | 1886 . . . . . | 145             | 15               |
| 1873 . . . . . | 5                             | 0.5              | 1880 . . . . . | 31              | 3.2              | 1887 . . . . . | 166             | 17               |
| 1874 . . . . . | 6                             | 0.6              | 1881 . . . . . | 41              | 4.2              | 1888 . . . . . | 194             | 20               |
| 1875 . . . . . | 7                             | 0.7              | 1882 . . . . . | 51              | 5.3              | 1889 . . . . . | 207             | 21               |
| 1876 . . . . . | 12                            | 1.2              | 1883 . . . . . | 60              | 6.2              | 1890 . . . . . | 241             | 25               |

Thus from 1870 to January 1891 altogether about 1,440,000,000 pounds, or about 149,000,000 barrels were obtained. Although the industry still remains almost entirely concentrated in the neighbourhood of Baku, still the production continues increasing every year. The data for 1891 are given below.

| ON THE APSHERON PENINSULA.                     |            | IN OTHER PARTS OF RUSSIA. |          |
|--|------------|---------------------------|----------|
| Pounds.  | Barrels.   | Pounds.                   | Barrels. |
| 288,800,000                                    | 29,700,000 | 2,300,000                 | 200,000  |
| Total: 291,100,000 pounds, 29,900,000 barrels. |            |                           |          |

Complete data are still wanting for 1892, but it is known that the yield on the Apsheron peninsula was 298.3 million pounds, or increased by 1,000,000 barrels.

The above data show that during the period of the last five years as much naphtha has been produced as during the previous twenty years, and there is no doubt that such a rapid exploitation would ultimately exhaust any other similarly small naphtha region as that of Baku, only 6 square kilometres in area, did there not exist the conditions of an unusually rich and still perfectly fresh, in a geological sense, deposit of naphtha. Indeed, geological surveys of the locality, conducted by many Russian geologists, show that the stratum of the naphtha-bearing sands of the Apsheron peninsula, and other parts of the Caucasus, belongs to the tertiary formations, that is, to the comparatively recent geological epoch of the upheaval of the Caucasian range.

The traces of the remains of a yet existant geological activity are seen in the mud volcanoes which bound the naphtha deposit on one side of the Apsheron peninsula. Without touching upon the yet contested question of the origin of naphtha, or of the material from which it is formed, it is impossible not to look upon the above circumstance as one of the causes of the richness of such naphtha deposits as that on the Apsheron peninsula, compared with those which contain naphtha in strata, belonging to more ancient geological periods, such as the Devonian; because many local conditions might arise in the course of geological time, for the escape of the naphtha from the strata, and in general for diminishing the amount fit for exploitation.

The escape of naphtha from the soil and hills, and other advantages of its application to the industries, were known to the natives of the Caucasus very long ago, and they collected the oil, and dug wells for its exploitation. Previous to its annexation to Russia in 1813 the Apsheron peninsula contained a great many of these wells, which were rented out by the khans to the inhabitants, who employed the oil to the amount of one to two thousand pounds, not only as a medicine against many diseases, but also for the two objects for which it is now used, that is, for lighting in *chiraks*, or peculiar clay lamps resembling the ancient Greek lamps, and as a lubricant for the axles of the *arbas*, or heavy native two-wheeled carts. Long ago the unrefined native naphtha was used for similar purposes on the Couban and Terek in the northern districts of the Caucasus. When the khanate of Baku became Russian, the wells were farmed out, and the idea then arose of obtaining an illuminating oil by distilling the raw material.

The first Russian experiments made by Mr. Doubinin in 1823 were made long before the application of photogen, (an illuminant produced by the distillation of boghead and peat), and kerosene, (a light naphtha illuminating oil). But these experiments did not lead to any practical results, chiefly owing to the fact that the farmers of the naphtha wells, who had a monopoly and only a temporary holding of the wells, had not the possibility of, or any direct interest in, introducing new improvements and measures which would require prolonged and persistent energy and expense. These measures and improvements were, however accomplished, and started in the sixties, chiefly owing to the endeavours of two individuals whose names have the same importance in the Russian naphtha industry as that of Colonel Drake in the United States industry. These two individuals began their labours at

the two extremities of the Caucasus: the one, Colonel A. N. Novosiltsev, on the Kouban, that is, at the north-west extremity of the Caucasian range; and the other, V. A. Kokorev, on the Apsheron peninsula, that is, at the south-eastern extremity of the Caucasian range.

Moreover, both these localities were near the sea, the first near the Black and Azov seas, where Colonel Novosiltsev erected his naphtha distilling works at Fanagoria, while Kokorev took advantage of the combustible gases which are evolved at Sourakhany, 17 versts from Baku, for conducting the distillation of the naphtha. These gases escape from natural crevices, and in ancient times formed motive for the erection of a temple of the Indian fire worshippers. Kokorev's works, which are situated alongside of the walls of the above mentioned temple, were erected in 1859, and when the author first visited them in 1863, they were already distilling naphtha bought from the farmer at 40 kopecks a pound, and transporting the refined kerosene in barrels to the interior of Russia, where, it competed with the American oil along the Volga.

On the Kouban, A. N. Novosiltsev proceeded in another manner; he rented a large area of land from the Kouban Cossacks, and began to explore the localities by boring wells, which led to the appearance of the first naphtha fountain, and induced Mr. Novosiltsev to erect the Fanagoria works. But the great labour devoted to the exploitation and treatment of the naphtha in this region did not lead to the desired end, not for want of material, but owing to the accumulation of debts and want of capital; so that the Kouban naphtha industry, which began so brilliantly, hardly has dragged on its existence to the present day, since the death of A. N. Novosiltsev.

The Kouban naphtha industry was divided during the lifetime of Colonel Novosiltsev; the estate of Koudako passed from his hands, and after his death a trusteeship was formed, which first rented the industry to an American, Mr. Tweddle, and then in 1883 to a share organization known as the Russian Standard Oil Co., but these new enterprises were not successful in their dealings. And although 94 wells were sunk the majority of them were small, about 200 feet, or 30 sagenes, deep, and although 39 of these wells are under exploitation, still they give out little naphtha, due mainly to the district not having been sufficiently explored. The yield in 1889 was 1,333,333 pounds, and in 1890, 1,800,000 pounds. Judging from existing data, the Kouban naphtha deposits have a greater resemblance to the American deposits, in the small yield of the wells, than to the Baku fields. But the comparative proximity to the Black Sea, which is free and does not freeze, gives the Kouban industry a great advantage. It was otherwise in the neighbourhood of Baku. Here, at the end of the sixties and beginning of the seventies, the first wells, and especially those sunk by Mr. Bourmeister, immediately proved productive, and frequently gave abundant, continuous, or periodic fountains of naphtha, which at Baku, as in America, were the chief means of attracting general attention to the vast stores of naphtha and gases held in the sandstone strata beneath the naphtha-bearing areas. The success which the first wells and distilling works had at Baku, evoked competition, and numbers of small distilling works were erected at Baku, which bought their naphtha from the farmers at 20 to 45 kopecks per pound, and sold the refined kerosene from 1 to 2 roubles per pound on the spot, or about 3 roubles per pound at Nizhni-Novgorod. The kerosene was sold in barrels which cost

about 40 kopecks per poud of kerosene. The naphtha fountains, the tendency towards the exploitation and treatment of the crude oil, the increased importation of American kerosene, and the comparatively small revenue of 100,000 to 162,000 roubles, brought by the farming out of the naphtha wells, together with the introduction of a civil routine after the pacification of the Caucasus, and especially the persistent scientific and mercantile indications of the possibility of founding a vast naphtha industry at Baku, induced the Government in 1872, to sell by auction the use of the chief naphtha-bearing areas, situated in the Crown lands near Baku. The conditions of sale were that the buyers were to pay a rental of 10 roubles per dessiatine for the land, and an excise upon the capacity of the stills, of about 15 to 25 kopecks per poud of kerosene. Notwithstanding these onerous conditions, land for nearly three million roubles was sold at the auction, and the exploitation and treatment of naphtha attracted many individuals to Baku, so that in 1874 the industry of the district made most rapid strides, and numerous borings were made and works erected, forming a special suburb of Baku known as the «Black town». Then means of transporting the kerosene by sea, and along the Volga, were devised, and, what was more important, the kerosene consumed in the interior began to decline in price, notwithstanding the excise, while the consumption extended and gradually displaced the American article. At that time, however, the quality of the Baku kerosene, and especially of that prepared at the small works, was unsatisfactory, owing to the fact that in order to diminish the excise dues, levied on the capacity of the stills and the time taken for the distillation, the latter process was conducted too rapidly, and owing to the high price of sulphuric acid transported from the Kama, and of caustic soda brought from abroad, the refining of the raw naphtha was imperfect. Competition, also, lowered the price and led to a crisis, to stop which, and at the same time facilitate the development and exportation of naphtha products, the Government in 1877 removed the excise from kerosene. In doing so the Government was guided by the results of experience and by the example of the United States, where naphtha and kerosene were also at first subject to an excise.

After this the Baku naphtha industry became perfectly free, and made rapid progress both in a qualitative and quantitative respect. This was greatly aided by the counsels of Russian scientific men upon the treatment of naphtha, and by the formation of large enterprises, and especially of the companies of A. E. Nobel and V. I. Ragozin. The first was established at Baku, and started large tank steamers and vessels for transporting the naphtha and kerosene by the Caspian Sea and the Volga.

This company also introduced a system of tank trucks upon the railways, and was the first in Russia to erect large iron reservoirs for storing the naphtha, kerosene, and naphtha refuse, and to establish a foreign trade in Russian kerosene, although for this purpose it had to be transported to the ports of the Baltic and to the western frontier, because at that time the Transcaucasian Railway uniting Baku with the Black Sea ports did not exist. The chief service rendered by Ragozin and Co., who erected their works on the Volga, near Nizhni-Novgorod and Yaroslav, was that they were the first to obtain excellent lubricating oils and cerates (unrefined vaseline) from the Baku naphtha, besides kerosene of the American type. Moreover, they succeeded in bringing these lubricants into use not only in Russia but also in Western Europe. At that time, that is, at the end of the seventies and beginning of the eighties, the price

of kerosene fell rapidly to 30 and 40 kopecks per poud at Baku, and to 1 rouble at Nizhni-Novgorod, owing to the great increase in the production and treatment of naphtha; and its internal consumption increased so much, that is, to about twenty million pouds per year, that all the factories, peasant huts, and streets throughout Russia began to use kerosene for light. At the same time the competition of many of the small, and several of the large firms, soon brought the production to dimensions easily exceeding the home demand, which now does not use more than twenty-seven million pouds of kerosene a year; hence there arose an urgent necessity for increasing the foreign export of naphtha products. Although it had long gone along the lengthy route of the Caspian Sea, the Volga to Tsaritzin, and thence by rail to the western frontier, still the transport by this route, notwithstanding all the improvements and modes of economy, could not avoid raising the price of the oil, and thus hinder its extension abroad. The true foreign trade in Baku naphtha starts from the middle and even end of the eighties, when the Transcaucasian Railway was completed and its transporting capacity increased by the construction of the Souram tunnel, and the introduction of a sufficient number of tank trucks. The following table gives the rise in the export of naphtha products abroad.

| Y E A R S.                   | Raw naphtha. | Mineral cerates,<br>vaseline etc. | Benzine and<br>other volatile<br>naphtha oils. | Kerosene and<br>other lighting<br>oils. | LUBRICATING OILS. |            | Naphtha refuse. | Total in mil-<br>lions of pouds. |
|------------------------------|--------------|-----------------------------------|--|---|-------------------|------------|-----------------|----------------------------------|
|                              |              |                                   |  |   | Refined.          | Unrefined. |                 |                                  |
| T H O U S A N D S P O U D S. |              |                                   |  |   |                   |            |                 |                                  |
| 1881. . . . .                | 182          | —                                 | —  | 134                                     | 309               | 277        | 67              | 1.0                              |
| 1882. . . . .                | 112          | —                                 | —  | 229                                     | 327               | 376        | 77              | 1.1                              |
| 1883. . . . .                | 284          | —                                 | —  | 1,494                                   | 454               | 1,267      | 60              | 3.5                              |
| 1884. . . . .                | 603          | 451                               | —  | 3,949                                   | 605               | 853        | 452             | 6.9                              |
| 1885. . . . .                | 1,129        | 85                                | —  | 7,249                                   | 648               | 1,490      | 208             | 10.8                             |
| 1886. . . . .                | 1,258        | 72                                | 0.5  | 9,195                                   | 776               | 1,452      | 2,256           | 15.0                             |
| 1887. . . . .                | 1,078        | 6                                 | 0.6  | 11,819                                  | 1,137             | 1,664      | 3,282           | 19.0                             |
| 1888. . . . .                | 299          | 3                                 | 0.7  | 27,363                                  | 1,516             | 1,282      | 4,481           | 34.9                             |
| 1889. . . . .                | 225          | 1                                 | 2  | 34,989                                  | 1,527             | 1,927      | 6,129           | 44.8                             |
| 1890. . . . .                | 761          | —                                 | 8  | 39,767                                  | 3,434             | 1,134      | 2,986           | 48.1                             |
| 1891. . . . .                | 870          | —                                 | 7  | 45,123                                  | 3,956             | 1,104      | 3,167           | 54.2                             |
| 1892. . . . .                | 297          | —                                 | 8  | 48,222                                  | 5,439             | 754        | 2,549           | 57.3 *                           |

The distribution among foreign countries is seen from the export of lighting oils for 1889 in the following table.

\* According to the customs estimate, for 27 million roubles, or on the average at 47 kopecks per poud.

| COUNTRIES.                  | Thousands of pounds. |
|-----------------------------|----------------------|
| Great Britain . . . . .     | 6,865                |
| Austro-Hungary . . . . .    | 4,010                |
| Germany. . . . .            | 2,783                |
| France . . . . .            | 45                   |
| Italy . . . . .             | 2,042                |
| Belgium. . . . .            | 1,841                |
| Holland. . . . .            | 538                  |
| Roumania. . . . .           | 527                  |
| Spain. . . . .              | 519                  |
| Denmark . . . . .           | 468                  |
| Norway and Sweden . . . . . | 413                  |
| Greece . . . . .            | 46                   |
| Turkey . . . . .            | 7,483                |
| Persia. . . . .             | 366                  |
| East India. . . . .         | 5,201                |
| China . . . . .             | 1,020                |
| Japan. . . . .              | 330                  |

Out of the 54 million pounds of naphtha and naphtha products exported, in 1891, 48 million pounds passed through the port of Batoum, which clearly shows that the export trade depends directly upon the transport capacity of the Transcaucasian Railway, which now transports about 60 million pounds of naphtha goods from Baku per year. Before arriving at Batoum and the intermediate stations, a portion of the naphtha goods go to Odessa and other Black Sea ports. The transport of about 60 million pounds, or nearly one million tons, a year in one direction by a single-line railway, is doubtless nearly the possible maximum; and this clearly shows that to transport the huge excess of over 250 million pounds of naphtha obtained in the neighbourhood of Baku, other routes must be devised for a profitable commercial traffic of the mass of naphtha goods between Baku and the ports of Batoum, Poti, Novorossiisk, and others, open for the international trade of the Black Sea, which in respect to the Caucasian naphtha, plays the same part as the shores of the Atlantic ocean for the naphtha of the United States. There, as is well known, the oil springs are connected with the ocean ports, or, strictly speaking, the distilling works situated around them, by means of numerous long pipe lines, giving the possibility of supplying the raw naphtha in the requisite quantity independently of the railways; such a pipe line, which would not only lower the cost of transport between Baku and Batoum, a distance of 840 versts, but also increase the export of naphtha products abroad, does not yet exist in the Caucasus. At the close of the eighties the question of the laying down of a pipe line between Baku and Batoum was much discussed in the Ministry of Imperial Domains, the Society for the Encouragement of Russian Industries, and by the Imperial Russian Technical Society; and the majority of opinions were fully agreed upon the urgent necessity and timeliness of

this measure. But nevertheless it was delayed and has not yet been realized, owing chiefly to the three following reasons: 1. The pipe line would necessarily decrease the transport of naphtha goods along the Transcaucasian Railway, which was at first guaranteed by the Government, and has now passed into the hands of the Crown, and was partly constructed for the purpose of transporting naphtha goods; 2. The centre of the naphtha industry, which is now at Baku, would be transferred to the shores of the Black Sea at Batoum and Poti, and this would revolutionize the existing order of the industry; 3. The Volga region and works in the interior of Russia would be deprived of naphtha refuse, which is an indispensable fuel in these localities. Although these arguments are evidently insufficient for solving the question, nevertheless for the time being they have taken the upper hand, and the pipe line still remains a question of essential importance. In speaking of this, one cannot but mention that: *a.* although the production of naphtha at Baku increases every year, still it becomes more difficult, and the wells have to be sunk deeper, and to be more numerous, and therefore the conditions of the greatest advantage of the pipe line have become modified; *b.* that the naphtha refuse, which could be used in manufactures with great profit on the coasts of the Black Sea, is now consumed as fuel; *c.* that the extended consumption of naphtha refuse in Russia retards the development and growth of the coal industry, especially in the Donets and Urals. The absence of a pipe line between Baku and Batoum forms an evident want in the development of the Russian naphtha industry; and its results will certainly reflect themselves upon this business, which in all other respects is a model industry in Russia. Thus, for the last twenty years, the production of raw naphtha in Baku has outgrown the means existing for its distillation into valuable products, and the existing conditions of trade in these products. In a word, here as elsewhere, the production of the raw material has, notwithstanding the evident commercial successes, taken the upper hand, or outstripped the manufacture and trade, and this is chiefly due to the richness of the natural productive forces of Russia. The Caucasian naphtha wealth can be best likened to the wealth of North and South America, of Chili and Bolivia, in copper and silver. One discovery is followed by another, only that portion is taken which is most easily gained, the prices fall, the conditions for the extension of the production decrease, a portion of the enterprises ceases working, and yet the total production increases to such an extent that the general prices of the products fall, and the universal demand in respect to quality increases. Such an order of things must lead to an extension of the demand for like mineral products, and the discovery of means for covering the losses in value by increasing the production.

In order to clearly state the present position of the Russian naphtha industry it is necessary to consider: *a.* the division of the Baku naphtha into different products, and more particularly the composition of this naphtha and the possibility of its entire utilization; *b.* the importance of naphtha refuse as a fuel; *c.* the conditions of the exploitation of the naphtha deposits.

### THE BAKU NAPHTHA PRODUCTS.

Although the area of the immediate Baku naphtha bearing district is rather uniform and very small, about 554 dessiatines, or 6.3 square kilometres, although the



number of wells under exploitation is also small, namely 458 in 1891; and although the low prices long existing in the Baku district \* almost forbid the exploitation of any but the rich wells, giving over 500 pounds per day, and necessitate the abandoning of those localities which give a thick, heavy naphtha, from the fact that such naphtha flows too slowly through the pipes, and gives but little of the ordinary kerosene, yet, notwithstanding these drawbacks, the naphtha obtained in the neighbourhood of Baku is far from being uniform in its component elements or qualities.

The light «white» naphtha, of specific gravity about 0.78 (15° C.), is now obtained at Sourakhany in too small quantities to deserve special mention. The wells situated to the south of Baku at a distance of only 4 to 6 versts, at the village Beibat or Bebi-Eibat, where in 1873 Mr. Tagiev started a regular exploitation and manufacture at his own works, give a lighter naphtha, sp. gr. 0.86, compared to the other kinds obtained in the Balakhano-Sabouchinsk and Romaninsk districts to the north-west of Baku, and where the majority of the wells are situated. This predominating naphtha, having a specific gravity of 0.86 to 0.88, and even 0.885, is called «green» owing to the green fluorescent rays it emits, although the transmitted light is brown, and forms the chief source of the Baku naphtha products; the «black» heavier naphtha of the neighbouring Binagadinsk district has a specific gravity of about 0.9 and above; at present it is but little worked, although it might be exploited in large quantities and advantageously employed as a fuel. Without entering into an examination of the chemical composition of the various kinds of Baku naphtha or lingering over its numerous technical analyses, by fractional distillation, it is necessary to cite the following fundamental data respecting the practical application of the oil, and moreover for the sake of clearness to compare these data with those for the Pennsylvania field.

#### AMERICAN NAPHTHA.

1. At the same boiling point, the Baku naphtha gives heavier products than the American, or products of equal specific gravity distill over at a lower temperature from the Baku naphtha than from the American.

2. The amount of carbon in the products of similar technical application, or like boiling points, is greater in the Baku naphtha than in the American, and therefore the lighting and lubricating capacity of the former is greater than that of the latter.

3. The amount of light volatile products of distillation, such as gasoline, benzine, et cetera, is far less in the Baku than in the American oil, and therefore the former can more easily give a safety lighting oil of the ordinary type, that is, kerosene or petroleum, than the American oil.

4. The ordinary Baku naphtha, of sp. gr. 0.87 to 0.88, gives 25 to 30 per cent by weight of such a kerosene which, having a sp. gr. of about 0.81 to 0.83.

---

\* The price of raw naphtha at the wells depends upon the demand of the works, and on the existence of a naphtha fountain at a given moment. Thus the price varies very rapidly and considerably. In 1890 it was in general high, from 4 to 9 kopecks per pound while in 1891 it was low, from 1½ to 4 kopecks per pound, and averaged 2½ kopecks. The price at the works is ¼ kopeck higher than at the wells, owing to the cost of transport.

burns in ordinary lamps constructed for burning the American oil; and has, owing to the removal of the more volatile components, a flash point of about 25 to 30° in Abel-Pensk's apparatus.

5. The Baku naphtha yields from 40 to 50 per cent by weight of heavy safety lighting oil, or Baku oil, having a specific gravity of 0.82 to 0.84 and a flash point of 40° to 60° C. But the safety oil, which is far better than the ordinary kerosene, requires lamps having a short distance between the wick and reservoir, and a regular current of air; and although such lamps are to be found, still they are made in far less quantities than those designed for burning the common and more dangerous oil of the American type.

6. After separating from the Baku naphtha those lighter products which give the ordinary kerosene of the American type, there remain from 10 to 30 per cent by weight of an intermediate, so-called solar or light house oil, of specific gravity 0.84 to 0.88, which is an entirely safe illuminant, its flash point being very high, from 60° to 100° C. and above, and which can be perfectly well burned in lamps specially constructed for the purpose, and capable of burning even a mixture of all the refined products of the distillation of naphtha, forming from 80 to 85 per cent by weight of the raw Baku naphtha, and a perfectly safe means of illumination, as the author demonstrated before the Russian Physico-Chemical Society in 1883, Vol. XV, p. 271.

7. After separating the benzine, kerosene, and intermediary oil from the Baku naphtha and continuing the distillation with superheated steam, about 10 to 30 per cent by weight of lubricating oils are obtained. These oils do not solidify in the cold, nor oxidize in the air, after prolonged purification with sulphuric acid and caustic soda, and have a specific gravity from 0.87 to 0.91, and a flash point above 100° C.; they are also suitable for every kind of lubrication.

8. After the distillation of these lubricating oils, the Baku naphtha gives a heavy refuse which, when distilled with the aid of highly superheated steam at 350° to 400° C., splits up with the formation of gaseous and volatile hydrocarbons into: *a.* a product which solidifies in the cold, and is known as «naphtha tallow» or *sebonapht*, which contains solid paraffins and, after the requisite purification, vaseline to the amount of 5 to 10 per cent of the raw naphtha; *b.* liquid hydrocarbons (their amount increases at the expense of the vaseline, as the pressure under which the distillation is carried on increases) suitable after refining for lighting in kerosene lamps; these products of decomposition were first investigated by the author, (*Journal of the Russian Physico-Chemical Society*, 1881, Vol. XIII, p. 456) and are now being studied by V. E. Tishchenko; *c.* combustible gaseous hydrocarbons having a high illuminating power, and serviceable as a fuel for the distillation of the raw naphtha.

Thus, the Baku naphtha is capable, as the author proved by researches which he carried out on a large scale at the Constantinov Works, of being totally distilled, that is, without leaving any carboniferous residue, and of giving a series of most useful products, which from the cheapness of the primary material and transport are open to a universal sale. But in reality such a perfect distillation or utilization of the Baku naphtha is at present impossible, owing to the fact that by this means 100 parts by weight of Baku naphtha give, after deducting those portions which are wasted

in the processes of distillation and purification, and which have to be consumed for conducting the actual process of distillation, not more than 80 parts of useful products. Hence the 280 million pounds of naphtha now produced should give about 225 million pounds of products. Out of this amount only 60, or at most 80 million pounds could be cheaply and profitably exported through the Transcaucasian Railway from Baku to Batoum for foreign consumption and 30, or at most 40 million pounds can be transported along the Volga for home consumption; this forms a total of from 90 to 120 million pounds per annum, that is, about one-third of the annual production of naphtha, or less than half of the possible amount of naphtha products.

Moreover, the entire utilization of the Baku naphtha is dependent upon the construction of lamps designed for burning the heavy safety oils, and this requires a particularly great perseverance, and forms a matter for the immediate future, and which can only be realized when the laying down of the Baku-Batoum pipe line gives the possibility of transporting from Baku not only those 50 to 70 million pounds of naphtha products which the railway is capable of carrying, but also raw naphtha to be treated on the shores of the Black Sea. As the matter now stands, the treatment of the Baku naphtha tends towards the production of only 30 per cent of distillation products, while the remainder forms the so-called refuse, consisting of the mixture which remains after distilling off the kerosene, when the ordinary light refuse is obtained, or after the distillation of the kerosene, intermediary, and lubricating oils, when the heavy abovementioned refuse is obtained. This refuse is employed as fuel in the place of coal, and is produced to the amount of about two-thirds of the weight of the raw Baku oil. A portion of this quantity, is consumed in the processes of distillation at the naphtha works themselves, and a far smaller amount is sold and exported, as is seen in the following data relating to Baku.

| AT THE APSHERON PENINSULA   | 1890. | 1891.          |
|---|-------|----------------|
| Total number of works . . . . .   | 149   | 135            |
| Number of works in action . . . . .   | 103   | 100            |
| »    »    » inactive . . . . .  | 46    | 35             |
| Amount of naphtha treated at these works in million pounds . . . . .                    | 220   | 247            |
| Amount of benzine, obtained at these works, in million of pounds . . . . .              | 0.5   | 0.5            |
| Amount of kerosene of different kinds, in million pounds.                               | 70    | 79             |
| Amount of lubricating oil obtained from the naphtha .                                   | 5.5   | 6.2            |
| Total production of distillation products, in million pounds.                           | 76    | 85.7           |
| Percentage of distillation products obtained . . . . .                                  | 34.5  | 34.7           |
| Naphtha refuse exported from Baku, in million pounds .                                  | 96    | 103            |
| Percentage of naphtha refuse exported . . . . .   | 43.6  | 41.7           |
| Loss and expenditure in fuel on the spot at the works, stores, town et cetera . . . . . | 22    | 23.6 per cent. |

It is known that, in 1891, 35 million pounds of refuse, or 14 per cent, were consumed in the processes of distillation et cetera, and for other local requirements; hence the actual loss is about 10 per cent of the total amount of naphtha treated at the works, and this loss is mainly due to the fact that, owing to the great cheapness of the raw naphtha, about 3 kopecks at the works in 1891, it is treated without any care, all the more so as in that year the price of the refined kerosene fell to 7 kopecks per pound, and the price of the refuse was about 4 kopecks per pound, that is, higher than that of the raw naphtha. All this shows clearly that the chief product of the Baku naphtha works is the naphtha refuse, and that the most important and, from their varied properties, valuable component parts of the Baku naphtha, such as the safety oil, vaseline, et cetera, are now burned as simple fuel without finding their proper and more valuable applications.

### THE IMPORTANCE OF NAPHTHA FUEL.

The common raw Baku naphtha, containing as it does highly volatile benzine and kerosene, cannot be used directly as fuel owing to its inflammability and danger from fire. But those varieties of heavy natural Caucasian naphtha such as the Binagodinsk naphtha near Baku, and many of the Kouban, Groznensk, Shemakhinsk and Transcasplan naphthas, which do not contain kerosene, lubricating and paraffine oils, or contain very little, as well as the refuse obtained in the treatment of raw naphtha, composed almost entirely of a mixture of hydrocarbons as they are, form a first class fuel in every respect. Such are the Baku naphtha refuse. Now, when in the absence of a Baku-Batoum pipe line it is impossible to utilize the entire mass of the naphtha produced, the employment of this refuse as fuel forms the most natural, although exclusively temporary phenomenon which Russia now takes advantage of to a somewhat large extent. Thus, about 140 million pounds of naphtha refuse are now annually consumed in Russia, about 30 million pounds being used at Baku itself for the naphtha and other local works; about 10 million pounds in other parts of Transcaucasia and in the Transcasplan regions; and about 100 million pounds on the Caspian Sea and Volga, and in the interior. It must be remembered that, when the Baku refuse obtained from the ordinary naphtha yielding kerosene and lubricating oils finds another and more valuable application as a source of safety oils, vaseline and illuminating gas, this refuse might be replaced not only by coal from the Donets and Urals, which might be transported along the Donets-Volga Railway and river Kama respectively, but also by the heavy natural naphtha which is abundantly distributed over the Caucasus, but is not at present exploited owing to the excess of the lighter ordinary Baku naphtha.

Leaving aside the question of the possibility of a more valuable utilization of this naphtha, the high qualities of the naphtha fuel far surpass those of the best kinds of coal even in respect to their calorific power, not to mention other advantages such as facility of carriage, safety for storage, generally in iron reservoirs, the absence of the necessity of stokerage, the uniform supply of fresh fuel to the hearth, the facility of having a total intermixture with the air by means of various kinds of pulverizers or tzers, the easy possibility of obtaining a maximum temperature, and the

simplicity of the construction of the furnaces. Naphtha and naphtha refuse, when burned in the calorimeter, evolve relative to their composition, and according to the determinations of many investigators, about 11,000 units of heat, for instance according to Mahler in 1892, 10,800 units; while the best kinds of coal do not evolve more than 7,400 heat-units. This relation requires the substitution of 100 parts by weight of coal by only 67 parts by weight of naphtha refuse, and this proportion is actually observed in the heating of boilers and locomotives by these two kinds of fuel. As Henri St. Claire Deville long ago showed, naphtha fuel is more advantageous than coal, and even than coke, in all furnaces which require a high temperature, such as smithy hearths and foundry furnaces.

This is due in the first place to the fact that naphtha contains a high percentage of hydrogen and no oxygen, and in the second place, which is still more important because naphtha fuel when properly regulated may be totally combusted like a combustible gas, without any excess of air, which is impossible with coal or coke if not converted into generator gases. A no less important quality in certain cases, as for instance in vessels of the fleet and in the centre of towns, is the faculty possessed by naphtha fuel of entirely burning under boilers and stoves without any trace of smoke, and of giving a flame of any required length, as well as of heating very rapidly. In a word, naphtha fuel must be regarded as the best form of fuel yet known. It is applicable to any kind of heating, for instance to house heating, kitchen and baker ovens, to steamers, locomotives, and other steam engines, and also to metallurgical and glass furnaces. Its application to these purposes is almost exclusively carried on in Russia, because this is the only country where it is cheap. During recent years its price at Baku varied between 3 and 6 kopecks per pound, and along the Volga from Tsaritsin to Nizhni from 10 to 20 kopecks, and in Moscow from 20 to 30 kopecks; but the price tends rather to fall than rise, because the amount of refuse produced at Baku increases every year, and the transport by water becomes cheaper, and the reservoirs or stores are everywhere increasing in number.

These low prices have resulted in naphtha fuel being employed in the steamers coursing the entire system of the middle and lower reaches of the Volga and Kama, and on all those navigating the Caspian Sea, as well as on the railways adjoining these water ways, especially the Transcaucasian and Transcasian railways. And these railways are greatly indebted to naphtha for their very existence, because the shores of the Caspian and the lowlands of the Volga, owing to their poor forest vegetation and the absence of workable seams of coal, are deprived of any other form of fuel, and the naphtha which occurs both on the west near the Sea of Bailov and on the Apsheron peninsula and near Petrovsk, and also on the east shore of the Caspian, on the island of Cheleken, and the adjoining ports of the Transcasian region: especially the heavier kinds of naphtha present the most natural if not the only local fuel. In other parts of the Empire naphtha fuel must be regarded as an exceptional and in some cases valuable material, as for instance for obtaining high temperatures, for use on board the Men of War, owing to its giving no smoke, and for obtaining a rich illuminating gas. When naphtha refuse is suddenly subjected to a high temperature in gas retorts, it gives a gas which is very rich in heavy hydrocarbons, and very luminous. But for the ordinary purposes of heating and especially for boiler heating, where any kind of fuel is applicable, an extended em-

ployment of such a valuable product as the refuse can be only temporary in such transitional moments of the industrial activity of a country such as Russia is now passing through, when the industry has not yet succeeded in laying itself in the true course of the stream, which is now everywhere dependent upon the employment of coal.

From the point of view of its quantity naphtha fuel can only have a small fraction of the importance which coal has, as is sufficiently proved by the fact that the production of coal over the earth is now over 500 million tons, while that of naphtha is about 10 million tons; that is, if all the naphtha were employed as fuel it would, upon the estimation that one ton of naphtha is equal to one and a half tons of coal, only replace 3 per cent of the coal now consumed. Thus, the present consumption of 130 million pouds of naphtha refuse in Russia, must be regarded as a temporary phenomenon, dependent on the one hand, upon the want of a market for the excess of naphtha, and on the other hand, upon a want of activity in the exploitation of the Russian coal, which is so widely distributed over the Empire, and especially in the centre and south-east. The laying down of the Baku-Batoum pipe line, the regulation of the course of the rivers Don and Donets, whose water courses are several times greater than the basins of such rivers as the Rhine, the construction of railways from the Donets coal district to the Volga, and such like measures for utilizing the naphtha stores of the Volga and for a cheap mode of transport for the Donets coal, form an immediate problem in the industrial life of Russia, and will put an end to the irrationally large consumption of the Baku naphtha refuse for steam power which is now practised. There is no reason for thinking that, even were the employment of naphtha refuse as fuel entirely stopped, it would be prejudicial to the steam navigation of the Caspian and lower courses of the Volga, because at first this refuse would be replaced by the heavy kinds of naphtha, and after a time by the Donets and Ural coal. Moreover, the author is of the opinion that coal seams should be found in the Kolmuk steppes between the Donets and Volga, and the exploitation of this coal would have great influence upon the shores of the Caspian Sea.

#### • NAPHTHA INDUSTRY ON THE APSHERON PENINSULA.

The mode of occurrence of naphtha in the Caucasus differs from that in America, as shown by the fact that in the United States there are tens of thousands of wells under exploitation in order to obtain 300,000,000 pouds of naphtha per year, while at Baku 500 wells yield the same quantity of oil. The Caucasus deposits may be regarded as sufficiently investigated from the point of view of its exploitation for the Apsheron peninsula only, because this district has not only contained numerous wells from very ancient times, but also owing to its being the object of full and systematically edited reports, which in recent years have been compiled by the Excise Department and by a special committee of the naphtha traders. The following forms an extract of the data for the last years.

The naphtha of the Apsheron peninsula is chiefly obtained from the wells by one of two methods: by means of buckets or fountains. The bucket system consists in lowering on a cable, by means of mechanical appliances such as windlasses or steam haulage

a deep bucket or cylinder having a valve at the bottom, and which raises the naphtha and water, and deposits into a gutter on the surface, leading to a reservoir. The dimensions of the buckets vary, but they are always large, bringing up as high as ten pouds at a time. In working upon this system, each well has its contingent of workmen, to the amount of not less than three per shift. More than four-fifths of the naphtha is extracted in this manner.

Fountains form an ordinary, if not a constant phenomenon in sinking wells in the neighbourhood of Baku, and some of these fountains have given, and continue to give some hundred thousand pouds of naphtha per day. They are always accompanied by the evolution of gases, and throw off water and sand and sometimes stones, which are often thrown up together with the naphtha to a height of 10, 20, and even 60 sagesnes.

The duration of the action, depending upon the pressure of the dissolved gases, and the mass of the naphtha cast up, depends upon the depth of the well and upon local conditions, but in general the deeper the well the more powerful the fountain. The naphtha thrown up by the fountains is collected, with every precaution against waste, by forcing helmets, or stopcocks, into the ends of the tubes lining the holes, and by this means directing the naphtha into reservoirs or pits. Still, a portion of the naphtha cast up is borne away by the wind and rushes into the earth, and sometimes destroys the derricks erected for the boring and buck-eting, and then it flows into special pits, or into the neighbouring lakes and lowlands. The amount of naphtha collected in recent years from fountains is from 40 to 50 million pound as indicated below :

Naphtha obtained on the Apsheron peninsula :

|                    |    |           |               |    |           |
|--------------------|----|-----------|---------------|----|-----------|
| 1889, by bucketing | 77 | per cent; | by fountains, | 23 | per cent. |
| 1890,              | >  | 78        | >             | >  | 22 >      |
| 1891,              | >  | 85        | >             | >  | 15 >      |

Thus, the amount of naphtha yielded by fountains has begun to decrease during the latter years; it should be observed, however, that although fountains are of rarer occurrence than before, still they are more abundant in naphtha than formely. In any case, after a certain period of activity the fountains cease flowing, and then recourse has to be had to the bucket system.

In 1891 the 554 dessiatines of naphtha-bearing land of the Apsheron peninsula were divided among 95 different firms. This area consists of 300 dessiatines of private, and 194 dessiatines of State lands. However, only 77 of these firms carried on the actual exploitation of the naphtha. In 1891 there were 458 wells under exploitation; in 1888, 239; in 1889, 278; in 1890, 356; while the total number of wells in 1891 was 641. Out of the 458 wells exploited in 1891, 407 were situated in the Balakhan-Sabounchinsk area, 25 in the Romaninsk area, and 25 in the Beibatsk field. During 1891, 28 wells were abandoned as being unprofitable, and out of those newly sunk, 70 proved unfit for working, either owing to their yielding no naphtha at all, or because they gave so small an amount that it was impossible to work them with a profit. Out of the 458 wells exploited in 1891, 308 were old and 150 new, the average yield of the former was about 605,000 pouds in the year, and of the

latter, 590,000 pounds. As the bucketing system not only requires the current expenses of labour, but also the storage or sale of the naphtha, and as the number of reservoirs and the sale are at times, especially in the winter, insufficient, therefore the exploitation of many of the wells is only carried on during a certain season. Out of the 458 wells, which yielded naphtha in 1891, only 132 were worked during the whole year, 188, from six to eleven months, and 138 for less than half a year. The diameters of the tubes in 67 wells were from 6 to 10 inches, in 278 from 10 to 15 inches, and in the remainder over 15 inches, and none more than 22 inches. The average depth of all the wells worked in 1891 was 102.2 sagenes or 715 feet; in 1890 this average was 94 feet, and at the commencement of the eighties it was only about 70 sagenes; thus there is no doubt as to the depth of the profitable stratum for working, although it cannot be said that all the superficial strata are exhausted, because there are still holes sunk to a depth only from 50 to 70 sagenes, and yet yielding as much as half a million pounds of naphtha per annum. However, there is no doubt that the depth which is the most profitable for exploitation, increases every year, and rather rapidly. Thus in 1890 the greatest average yield, about 1,333,333 pounds per well per annum, corresponded to those holes which were sunk to a depth of 120 to 130 sagenes, while in 1891 the highest average yield of 1,500,000 pounds was given by a well sunk to a depth of 140 to 150 sagenes. The total average annual yield for all the wells exploited was 803,000 pounds in 1888, about 692,000 pounds in 1889, about 636,000 pounds in 1890, and about 599,000 pounds in 1891 per well.

The average daily yield is also decreasing over all the naphtha areas, as the following figures show.

| AVERAGE DAILY YIELD PER WELL.      | 1890. | 1891. |
|------------------------------------|-------|-------|
| Balakan-Sabouchinsk area . . . . . | 1,714 | 1,622 |
| Romaninsk area. . . . .            | 1,431 | 1,386 |
| Beibatsk . . . . .                 | 2,782 | 2,654 |

In looking at these figures it must not be forgotten that the total production of naphtha in 1891 was 50 million pounds, or 20 per cent greater than that of 1890, and that the number of active wells increased by 102, or almost 30 per cent. That is, in 1891 endeavours were made to cover the losses which were incurred by the fall of the price of naphtha, by increasing the production. Hence the number of wells sunk during recent years has increased. In 1889 fresh borings were conducted to a total depth of 6,500 sagenes, in 1890 to a total depth of 14,810 sagenes, and in 1891 to a total depth of 19,980 sagenes. During these three years, altogether 284 new holes were sunk, namely 86 in 1889, and 151 in 1891. The cost of boring, including the cost of steam power, erection of derricks, and lining with tubes, is now on the average from 170 to 200 roubles per sagene, so that the total cost of the new holes sunk in recent times, is about four million roubles per annum.

If this yearly expense in boring be accepted, and the number of active wells be taken as 500, and the current expenses for labour, fuel, et cetera, per well per



year be 2,000 roubles, then the fundamental current expense of exploitation, not including the expense of administration, percentage on capital et cetera, will be 5 million roubles per annum, which, with a production of 250 to 300 million pounds, makes the cost of production per pound of naphtha one and two-thirds to two kopecks, whence it is clear that a market price of two and one-half kopecks at the wells in 1891 cannot repay the producers. It is evident that the price of raw naphtha must rise in the course of time.

Besides open pits capable of holding as high as 25 million pounds, for storing and settling the naphtha, there are in the neighbourhood of the wells covered earthen reservoirs having a total capacity of 6 million pounds, stone and brick reservoirs having a total capacity of 5 million pounds, wooden reservoirs of 1 million pounds capacity, and iron reservoirs of 5 million pounds capacity. Altogether, up to 40 million pounds can be stored at the wells, but as a rule the amount stored at one time is less, because the works situated about Baku buy up the naphtha for converting it into kerosene, and other products. The naphtha is transported from the wells to the works at a distance of from 8 to 17 versts, by means of 19 naphtha pipe lines, while there are 6 pipes for supplying sea water from Baku to the wells, and for feeding the boilers situated there.

The total length of these pipe lines is about 250 versts, and the cost of pumping the naphtha through them is generally about one-half kopeck per pound.

In order to characterize the position of the naphtha industry in the Caucasus, it will be enough to mention that in 1890 there were 135 works in action, yielding about 69 million pounds of illuminating oils. Out of these works, one belonging to Nobel Brothers and Co. produced about 18 million pounds of kerosene; four works, belonging to Tsatourov, The Caspian-Black Sea Company, Tagiev, and Shebaev and Co., each turned out from 4 to 5 million pounds, and eight works, over one and one-half million pounds each. Thus, 13 works yielded about 51 million pounds of kerosene, and consequently the remaining 122 belong to the order of small concerns. But these small works, especially in former years at the beginning of the eighties, had a great importance, because they did not permit the formation of any monopoly, and by their competition with the large works helped much towards lowering the price of the Caucasian naphtha products. The part played by the large concerns, especially in extending the market and in erecting stores, is naturally also very important; and thus there is that combination and competition of small and large producers, which is the most desirable for the successful growth of the industry. In speaking of the treatment of the naphtha at the works, it should be mentioned that, besides the 135 in the Caucasus, there are 32 in the interior of Russia, along the Volga near Yaroslav, in the neighbourhood of Moscow, and St. Petersburg, which either treat the raw naphtha \* or the refuse, but their total production is far less than that of the Baku works, although their number increases every year. These few words on the Russian naphtha industry must be supplemented by a few data respecting the foreign export of naphtha products, and the customs and excise dues levied upon them.

---

\* The export of raw naphtha from Baku to the Volga is equal to 5 to 6 million pounds per annum.

In Russia the illumination of houses and towns by lamps burning vegetable and animal oils began to be replaced by lamps burning liquid hydrocarbons, at the end of the fifties. This change was brought about by two equally important circumstances: in the first place, by the relative cheapness, in 1838 in St. Petersburg the cost of lighting by photogen being 4 roubles per pound; and in the second place, the greater facility of managing lamps burning the hydrocarbons. The material at first used for this purpose was photogen, which was obtained from peat, Scotch boghead, and bitumenous schists. It was imported and afterwards prepared in Russia from peat, imported boghead, and from the excellent boghead occurring in the government of Riazan. But the high price of this product, and the possibility of employing the cheap Russian turpentine, especially mixed with spirit, which mixture was largely used at the middle of the present century for street lighting in Russia, and above all, the appearance of the product of the distillation of the American naphtha upon the European markets, all these factors soon put an end to this mode of lighting houses and towns. The importation of photogen, and subsequently of American kerosene, naphtha, and lubricating oils across the European frontier, is given in the following table.

| Y E A R S.     | KEROSENE.                          | NAPHTHA. | LUBRICATING<br>oils. |
|----------------|------------------------------------|----------|----------------------|
|                | T h o u s a n d s o f p o u n d s. |          |                      |
| 1871 . . . . . | 1,720                              | 30       | —                    |
| 1872 . . . . . | 1,798                              | 98       | 8                    |
| 1873 . . . . . | 2,716                              | 108      | 15                   |
| 1874 . . . . . | 2,532                              | 105      | 8                    |
| 1875 . . . . . | 2,661                              | 42       | 8                    |
| 1876 . . . . . | 2,679                              | 56       | 16                   |
| 1877 . . . . . | 1,723                              | 41       | 21                   |
| 1878 . . . . . | 2,004                              | 55       | 15                   |
| 1879 . . . . . | 1,720                              | 30       | 8                    |
| 1880 . . . . . | 1,453                              | 26       | 8                    |
| 1881 . . . . . | 1,213                              | 27       | 9                    |
| 1882 . . . . . | 1,047                              | 16       | 8                    |
| 1883 . . . . . | 459                                | 19       | 10                   |
| 1884 . . . . . | 276                                | 14       | 7                    |
| 1885 . . . . . | 140                                | 2        | 7                    |
| 1886 . . . . . | 46                                 | 0        | 6                    |
| 1887 . . . . . | 15                                 | 0        | 7                    |
| 1888 . . . . . | 12                                 | 0        | 7                    |
| 1889 . . . . . | 14                                 | 0        | 10                   |
| 1890 . . . . . | 8                                  | 0        | 15                   |

The largest import occurred in 1876, at the very time when preparations were being made to remove the excise from kerosene and when the exploitation and treatment of the Baku naphtha began to rise rapidly. However, there is no doubt that the importation of foreign naphtha products gave the first impulse to the development and growth of the home naphtha production; and in this the part played by the customs duties was exceedingly important, in as much as they helped the pioneers of the home production to compete with the foreign exporters. The dimensions of the customs duties per poud net upon various naphtha goods are given in the following table.

|                            | 1863          | 1877         | 1881          | 1882         |
|----------------------------|---------------|--------------|---------------|--------------|
| Raw naphtha . . . . .      | 15 kop. paper | 15 kop. gold | 16½ kop. gold | 17 kop. gold |
| Kerosene . . . . .         | 55 » »        | 55 » »       | 60½ » »       | 60 » »       |
| Lubricating oils . . . . . | 55 » »        | 55 » »       | 60½ » »       | 60 » »       |
|                            | 1885          | 1887         | 1890          | 1891         |
| Raw naphtha . . . . .      | 20 kop. gold  | 20 kop. gold | 24 kop. gold  | 20 kop. gold |
| Kerosene . . . . .         | 70 » »        | 100 » »      | 120 » »       | 100 » »      |
| Lubricating oils . . . . . | 70 » »        | 70 » »       | 84 » »        | 100 » »      |

The increase of the import duty upon kerosene in 1887 corresponds to the placing of excise upon the oil consumed in the Empire.

The high customs duties during 1868 to 1878 undoubtedly had an important protective influence upon the development of the home production, and subsequently, when the industry had gained sufficient strength to render the customs protection unnecessary, they were retained as a protection against the importation of naphtha goods to the frontier towns situated at a distance from the Caucasus, and also as a defence over the large excise revenue from the kerosene of home production.

The customs duties upon Russian naphtha goods clearly demonstrate the impulse which high dues may give to the development of an internal and universal production, if only they answer to the internal store of raw material, and to the conditions of the country; and the Russian tariff of 1891 is firmly established upon that principle. They prove in the second place that high customs duties upon such a class of goods as naphtha, do not in any way prevent the prices from falling, as in Russia when the duty upon kerosene is equal to 20 kopecks gold, or 30 kopecks paper, the price of kerosene on the spot of production is equal to 7 to 20 kopecks, without excise, which is less than the customs duty. It is often said that with protective duties, the price of goods inside the country is always equal to the duty and the cost of production, that is, that the duty goes to the advantage of the producer. The instance in question distinctly contradicts this supposition, although only 25 years have passed since the rise of the naphtha industry in Russia.

After the customs duties, the most important factor in the development of the Russian naphtha industry, is the excise upon the illuminating oil of home production. It has already been said that the excise upon the capacity of the stills, to the extent of about 15 kopecks per poud, was only in force from 1873 to 1877. After its removal the industry made rapid advances, the consumption of kerosene began

to increase considerably, the export of naphtha products began to rise and the prices to fall rapidly, owing to home competition. This combination of circumstances, and especially the fact that, during 1877 to 1886, the price of kerosene declined by at least 60 to 80 kopecks per pound, the price being only 20 to 30 kopecks per pound, induced the Government, in view of the urgent requirements of the treasury, to again turn to an excise upon kerosene, which was introduced in 1888 to the amount of 40 kopecks paper per pound on ordinary kerosene, and 30 kopecks per pound on the heavy qualities of high flash point. Benzine, lubricating oils, raw naphtha, and naphtha refuse, were free from duties, as also were all naphtha products sent abroad. At the close of 1892 these dues were raised to 50 and 60 kopecks per pound, and the differences between the dues paid upon the heavy and ordinary kerosene were somewhat modified, although the main principles were preserved.

In 1888 . . 6.6 million roubles paper    In 1890 . . 18.2 million roubles paper  
 » 1889 . . 9.3    »    »    »    » 1891 . . 10.2    »    »    »

These figures show that the imposition of an excise has, in raising the price, retarded the previous growth of the consumption. This is seen in the BB in the accompanying diagram, which gives the production of raw naphtha along AA, and the amount of naphtha products produced along CC, and hence AC gives the amount of refuse, and CB the export of naphtha products.

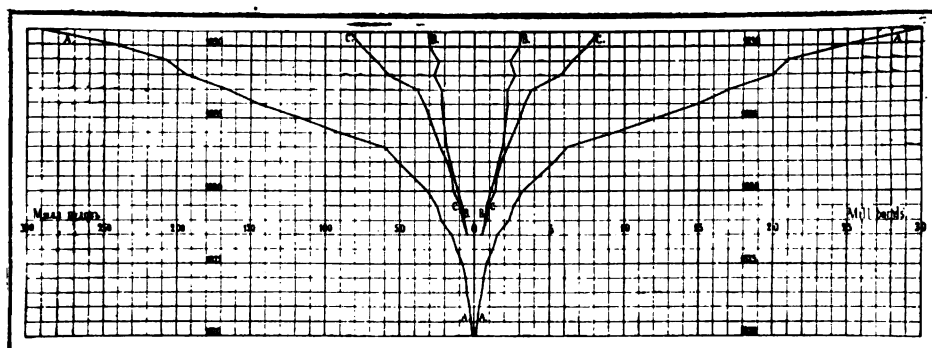


Diagram depicting the development of the Russian naphtha industry, from 1870 to 1891; to the left in million pounds, to the right in million barrels of 40 gallons capacity; AA production of raw naphtha, BB home consumption of kerosene and other lighting oils, CC amount of naphtha products.

In summing up the position of the Russian naphtha industry at the beginning of 1892 the result would be, in rough figures, the following:

|  |                     |
|--|---------------------|
| Number of wells under exploitation . . . . . | 500                 |
| » » works distilling naphtha . . . . .       | 167                 |
| » » » » at Baku . . . . .                    | 135                 |
| » » » » in other parts of Russia . . . . .   | 32                  |
| Annual production of naphtha . . . . .       | 290,000,000 pounds. |



## CHAPTER XVI.

## Cements.

**T**HE foundation of the manufacture of cements in Russia dates from the fifties of the present century, an epoch which is in general memorable in many respects, in the history of the making of cements throughout Europe. The position of affairs with respect to the manufacture of cements in the first quarter of this century is partially explained by the fact that the Roman methods of preparing cements, especially those designed for submarine works, had been lost and new ones had to be discovered.

Although at the very beginning of this century a special kind of local native material was found in England, and immediately after in France, which, after roasting, gave a cement of higher and more durable quality than hitherto made (J. Parker. nodules of clay; Lesage, galets de Boulogne); these cements were named «Roman cements» after the ancient makers. However, the development and general extension of the cement manufacture was barred by those elementary conditions to which it is in principle subject from its chemical aspect. It belongs to the number of those, perhaps few technical branches, whose foundation as an industrial manufacture cannot be accomplished by a method of initiation or transplantation from one soil to another by the customary empiricals of industry, notwithstanding that the actual technical processes and instruments of the manufacture are as simple as can be, consisting as they do of breaking up the material, roasting it in ovens of well known types, and then pulverizing it in mills.

Owing to the great variety of the lime stone rocks which can be used in this manufacture, it must at the very commencement be founded upon a clear knowledge of the elementary principles of chemistry, upon which a choice of the most suitable material and methods of manufacture are based. In the mean while chemical science, in which the question of the conditions and processes of the formation of the hydrated silicates, which harden under water, was always one of the most complex, notwithstanding its seeming simplicity, only gave its fundamental indications in comparatively recent times.

The chief basis of the matter was only laid towards the beginning of the second quarter of the present century, in the researches of Vica, which extended in their details over the whole of that quarter of a century and more. This famous French savant, after having discovered the first bases for making a choice of the material for the manufacture of the so-called natural Roman cements, and also of the artificial cements, travelled over the whole of France, and pointed out to the local builders and engineers the best localities for finding cement-making materials, and the most advantageous methods of converting them into cement. At that time, however, it was not everywhere that manufacturing industry and experimental science went thus hand in hand.

When in 1825, in practical England, there first appeared, as an undoubted echo of Vica's work, that now most important and highest branch of cement manufacture, the production of Portland cements prepared by the then little known method of strongly calcining the material to incipient vitrification, then the evident adaptability of this English manufacture to the original local material upon whose properties, it seemed to many, the incomparable qualities of the resultant products were exclusively dependent, was enough to guarantee to England a monopoly of this manufacture for fully twenty years. Even at the time of the London Universal Exhibition of 1851, the English savants said with conviction that the mixture of chalk and natural river silt, or the argillaceous deposit of some rivers running over clay and chalk, which they employed for the manufacture of Portland cement, could not be successfully replaced by any other artificial mixtures of limestones and clay; they said furthermore: «It is not difficult to procure artificially mixtures of limestone and clay, which are less costly than the natural kinds, though not equal in value» (Report of the Juries p. 573, Exhibition 1851). The English Portland cement became an important article of export, and very large quantities were furnished to the shores of the Arctic Ocean, Baltic Russian ports, and to France and Paris, where the English cement was particularly used in large quantities in the construction of the large northern ports. This state of affairs continued to the middle of the present century, and even in 1856 the experts of the Paris Universal Exhibition certified that, «notwithstanding the greatly extended use of the English Portland cement its manufacture had, contrary to all expectations, remained but little studied». This closes the first period of the history of the manufacture of cements.

During the fifties, the fundamental data, which were required to guide the development of this industry, began to increase rapidly, and at the same time the first endeavours were made to establish the manufacture of Portland cement on the Continent. It was proved in 1850 to 1851 that, when hydraulic limestones of a suitable composition are calcined to incipient softness, they give cements which conglomerate slowly, but attain an immense hardness in the course of time.

The manufacture of Portland cement in France in was first started 1850 at Boulogne-sur-mer, by Messrs. Dupont and Demarle; and almost simultaneously, in 1852, in Germany at Stettin. The manufacture at Stettin was founded upon a process elaborated by Dr. Bleibtree of Bonn. The process was similar to that practised in England; the cement was prepared from chalk and clay, extracted in the neighbourhood of Stettin. At that time England, recognizing its monopoly in the manufacture of cements, and the importance of this material for marine works, ceased

exporting its Portland cement to Russia, with which previous to the Crimean war it was in hostile relations. The export of cement from England to Russia was forbidden by a special decree of the Queen of England, and this was one of the chief reasons for the erection of cement works at Stettin. The Portland cement made at Stettin was from the first distinguished for its high qualities, and was chiefly manufactured for the Russian market (Exposition Universelle 1855, rapports du Jury mixte international II, 143).

Thus, the beginning of the fifties saw the establishment of the manufacture of Portland cement in France and Germany. At the same time, the first manufacturing enterprise dealing in cements was also initiated in Russia by a military engineer, P. E. Roshé in 1851. The first beginning towards the establishment of cement works in Russia had already been made. Towards the close of the reign of the Emperor Alexander I, during the twenties, a French engineer Baucourt de Charleville, in his time a known specialist on this branch of the building arts, and one of the first to realize in France the just elaborated methods and principles of Vica, was invited to Russia for the purpose of imparting information respecting hydraulic solutions, and for the investigation of Russian local materials suitable for the manufacture of cement. The then Chief Director of Ways of Communication in Russia, General A. M. Betancourt, nominated De Charleville, Professor of the Building Arts at the Institute of Ways of Communication, and at the time commissioned him to conduct researches in Russia, similar to those which he had already carried on in France. The vast work of De Charleville was printed in 1822 (*Traité sur l'art de faire de bons mortiers, et cetera*; St-Petersbourg, imprimerie des voies de communication 1822, in 4°, 362 p.).

Among the Russian limestones investigated by De Charleville, were those of the town of Narva, where he constructed a bridge over the river Narova below the falls, and which is distinguished for its exceedingly rapid current. He also investigated the limestone of the shores of Lake Ladoga, where General Basen was then conducting large hydrotechnical works, and also the Tosna limestone which had a special interest in view of its importance for building purposes in St. Petersburg. The researches and experiments of De Charleville on the best methods of preparing hydraulic solutions from local limestones, were of great importance to civil engineering and were then and subsequently made use of, and their influence was partly seen thirty years later in the organization of a cement industry at the first Russian cement works established at St. Petersburg.

It became known that the Tosna limestone contains all the materials for the formation of a good hydraulic cement, and that even the common burnt lime from Tosna, used for simple mortars, evinces certain hydraulic properties. Colonel P. G. Roshé who was commissioned by the Government to investigate the limestones of the government of St. Petersburg, confirmed the statement that those layers of the Tosna limestones, which contain the most clay, are capable of giving a good hydraulic solution. These researches, which were based upon facts indicated by theory, were confirmed by actual experience. In 1851 Roshé started the erection of a cement factory on the banks of the Neva in the district of Schlüsselburg, 25 versts distant from St. Petersburg; and by successive experiments he elaborated a method for the manufacture of a good Roman cement from the Tosna limestone. In the sixties,



many buildings erected with the aid of this, the first Russian cement, gave proof of its satisfactory qualities, for instance, the tower of the St. Petersburg water works, which is, with all its submarine parts, 26 sages high. The great advantage of this new cement was that it cost a third of the price of the English cement, it being from 16 to 20 kopecks per pound, while the English cost 60 kopecks.

In 1866 Roshé's works, which then had a production of about 200,000 pounds per annum, began to use the Volkhov limestone, from the banks of the river Volkhov, which contains from 16 to 25 per cent of argillaceous impurities, and which now remains the material used by the St. Petersburg cement works. The influence of Minard and Villeneuve's theory respecting the so-called basic carbonate of lime, which was accepted by the managers of Roshé's works, hindered the first Russian cement works from passing from the manufacture of Roman to Portland cement, and which was soon considered indispensable, upon the principle of not carrying on the roasting of the stone to softness. This peculiarity in the mode of manufacture at Roshé's works, which was not entirely satisfactory in regard to the quality of the material treated, was remarked somewhat later, in 1868, and explained by the researches of one of the best known specialists upon cements, Prof. A. R. Shouliachenko\*, who subsequently founded the production of Portland cement from the same material in St. Petersburg. After Roshé's works which are still in existence under other proprietors and are known as the «Star Works», the oldest cement factory in Russia is the hydraulic lime concern of J. K. Pahl, which was erected in 1852, adjoining the lime kilns of the same proprietor in the Peterhov district, in the village of Zoborie. In the seventies these works produced up to 80,000 pounds (8,000 casks). At the present time they have stopped working.

Soon after the establishment of the first cement works in St. Petersburg, other similar enterprises were started in another locality on the border line of Russia, in the south-west frontier corner of Poland, where the Russian and the Austro-German boundary lines meet. In this region a small Roman cement works was first started in the government of Kelets in the Olekoushsk district at the village of Slavkovo. These works were erected by Mr. J. J. Tsekhanovsky in 1853. Four years later a somewhat larger Portland cement factory was erected in the government of Petrokovsk, in the village of Grodzetsy, where the manufacture was greatly facilitated by the fact that it could be carried on with the aid of the neighbouring coal. This was the first Portland cement factory in Russia; at first its production was limited, but towards the close of the sixties it rose to 250 to 275 thousand pounds a year, or 20 to 23 thousand twelve-pound casks; owing to the geographical position of the works, they not only supplied the local requirements, but also found a market in the neighbouring parts of Austria and Prussia, and up to the seventies the foreign sale formed their chief support\*\*.

The present development of the Russian cement manufacture, begins with the erection of a cement factory on the Baltic sea frontier, at Podera near Riga, which was started upon the initiative of one of the most active industrial organizers of the

\* See Jahresbericht für Chemie 1868, p. 939—940.

\*\* Factors of the Russian Industrial Exhibition of 1870; St. Petersburg, Section II. Class 8. Guide book of the exhibition of 1870, p. 126. Class 8. № 34.

town of Riga, Mr. K. C. Schmidt. The researches of Prof. V. P. Liven of the Yuriev University, published in the «Archives of the Natural Sciences of Lithuania», upon the composition of cement-forming materials and the conditions of their hardening which preceded the erection of Mr. Schmidt's works, were begun in 1865, and these works were built by Prof. Liven in 1867. Very soon afterwards, the same learned chemist appeared as the constructor of another Baltic cement works at Port Kunda, near Vesenberg, half way between Narva and Reval. These works were started in 1870. Subsequently, in 1882, Prof. Liven erected the Black Sea Cement Factory at Novorossisk near the port of Novorossisk on the north-eastern side of the Black Sea. These works are the property of the Black Sea Cement Company. For further information respecting Novorossisk, see «Novorossisk, Its Shipping and Facilities, St. Petersburg, 1891.»

The wide scientific experience of Prof. Liven upon the manufacture of cement, is proved by the fact that at each of these three large works which he erected and organized, the quality of the Portland cement produced was equally good, although the local conditions and the materials used were totally different. At Riga the manufacture was at first founded upon the scanty local material, but it soon went over, as the production increased, to the employment of soft chalk imported from England. At Port Kunda the enterprise was based upon the abundance of excellent fresh water marls found in the neighbourhood, and which have now been worked for over twenty years. At Novorossisk a natural clay limestone is roasted, which is described in a paper by Mr. Stavitsky in the «Records of the Caucasian Section of the Technical Society», Vol. XVII, Number 5, which also contains the analyses made by Liven. These works, amongst which the Riga works, as the oldest, long stood first in the amount of its production, are still most important in Russia.

During the six or seven years interval between the foundation of these three works, several smaller Roman and Portland cement works were erected. Thus, the Roman cement factory at Kerch, on the Sea of Azov, were erected in 1868 by M. J. Cherkassov, and towards the seventies turned out about 4,000 casks, or 40 thousand pouds, with a plant of five cement kilns. Another cement factory was established in the Caucasus, in the government of Koutais near Poti, at about the same time, for the purpose of supplying the works of the port of Poti. These works treated hydraulic marls which were found, after some surveys made at the instigation of the Administration, by Mr. Bakhmetiev (Transactions of the Kiev Section of the Technical Society IV, 19) near the village of Teklat in the government of Koutais. These works, however, were soon closed, as the French Theil hydraulic lime was prepared for the Poti port works, although it was dearer. This Theil lime (Theil, canton de Viviers dép. de l'Ardèche) has been worked in the Lafarge quarry for centuries, and gives a hydraulic product which resists the action of sea water very well. The greater number of the ports of the south of France have been constructed with this lime. It was imported first to Poti and then to Batoum in very large quantities, until 1882, when the Novorossisk works were founded, and when the conditions for supplying the Black Sea ports with cements for submarine works entirely changed.

The Finnish factory «Savio» was built by Mr. Brummer in 1869, in the Neu-landsk government in the parish of Tusbio, about 2 to 3 miles by rail from Helsingfors, and it has made considerable progress in recent years. The works erected in

1870 by C. C. Bolov in the government of Kharkov, in the district of Valkovsk at the village of Starya Vodolaga, did not remain in action long. Emile Lipgardt & Co's works near Kolonna, at Schurovo on the Moscow-Riazan Railway, were established in 1875, and are now working. In the same year the Moscow «Podolsk» factory, near the station of Podolsk on the Moscow-Kursk Railway, were founded by Mr. Porokhovschik aided by Mr. Kouchera a chemist, and continued for four years without particular success. These works afterwards passed into the hands of the «Moscow Joint-Stock Company for the Manufacture of Cements and other Building Materials», and after being completely rebuilt, in 1887, began to work regularly, and now stand among the chief Russian cement works. Lastly, in 1877, the small Zdolbounovsk factory was erected at the station of Zdolbunovo on the Kiev-Brest Railway in the district of Ostrogozsk in the Government of Volynia by Mr. E. J. Elenek, an Austrian subject.

The last ten years 1883 to 1893 were noted for a particularly large growth in the production of the Russian cement works, which was further increased by the erection of two new centres of production, the «Vissoko Works» in Poland at Laza on the Warsaw Vienna Railway, founded in 1885, and the «Gloukhoozersk Factory» in St. Petersburg, where the results of Prof. Shouliachenko's vast scientific researches, were applied to the production of Portland cement with brilliant success. At the present time both these works belong to the number of the largest Portland cement works in Russia. Thus, there are now seven large Portland cement works in Russia, the Biga, Port Kunda, Novorossisk, Gloukhoozersk, Podolsk, Vissoko, and the Grodzetsk. To these may be added the smaller Schurov works of Lipgardt and Co., which also manufacture Portland cement. Of the remaining factories above mentioned the following are now working: the St. Petersburg, Star Roman, of Roshé, the Finnish Savio, the Kerchensk Roman, and the Zdolbounovsk works in Volynia.

The majority of the Russian Portland works carry on, as is usual, the manufacture of artificial cement; that is to say, they prepare their fundamental clay and lime material by making an artificial mixture of the two component parts; moreover, they generally work after the wet method (grinding with water, stirring vats, large, settling vats, puddling before moulding in hand moulds, and drying stands). The St. Petersburg Gloukhoozersk Works carry on the mixing by the dry method (drying the material in drying chambers, dry grinding, sifting, making into a thick paste, and moulding in a brick machine). The Novorossisk factory operates upon a natural Portland cement produced by directly roasting a clay limestone, certain layers of which present a ready made natural mixture which entirely answers to all the requirements of Portland cement. Besides ordinary kilns working with coke, nearly all the factories possess Dietsch ordinary double ovens, in which the cement is roasted by means of coals. Some works, for instance the Podolsk, employ Hofman's circular ovens.

The grinding of the materials, and of the cement itself after roasting requires, as is known, the expenditure of a very considerable power, depending upon the mineralogical hardness of the limestone treated, and also partly upon that of the product after roasting. Of all the Russian Portland cement factories, that at Port Kunda treats the softest limestone, and works with engines having a total of about 300 horse power (two turbines and one steam engine, and another turbine of 150 horse

power is now being erected for enlarging the production). The other extreme is represented by the Moscow Podolsk works, which use a hard limestone and have 7 steam engines of a total of 900 horse power, although the output is slightly less than that of the Port Kunda factory. These data have been communicated by the chief director of the Podolsk works, Mr Ruhart. The large foreign manufactories, such as the Dekerhov on the Rhine, and the Allsen in the north of Germany, employ twice as much power. It may be said that altogether the eight existing Portland cement factories in Russia employ a motive power of not less than 2,500 horse power; out of these the Riga works have about 480 powers, so that the above-named three oldest works have together about 1,680 horse power. The amount of coal and coke annually consumed in the production of Portland cement at these factories is about 3,500,000 pouds. All the works have their own cooper shops, and the hoops for the casks sometimes form an object of rural industry in the same neighbourhood. The normal trade weight of a cask of cement is 11 pouds gross, and almost 10 $\frac{1}{2}$  pouds net, similar to the German cask of 170 to 175 kilograms. According to the latest official data the normal weight of a cask is somewhat less, between 164 and 168 kilogrammes\*.

The present production of the Russian Portland cement factories in 1890 is given in the following table, which is compiled from data furnished by the works to the Meeting of the Cement Manufacturers in St. Petersburg, in Februry, 1892.

| PORTLAND CEMENT.                           | PRCDUCTION<br>IN 1891. |
|--|------------------------|
|  | Casks.                 |
| 1. The Vissoko in Poland . . . . .         | 118,000                |
| 2. The Gloukhoosersk in St. Petersburg . . | 117,000                |
| 3. The Grodzintsk . . . . .                | 112,000                |
| 4. The Novorossisk . . . . .               | 173,000                |
| 5. The Podolsk . . . . .                   | 95,000                 |
| 6. The Port Kunda . . . . .                | 120,000                |
| 7. The Riga . . . . .                      | 140,000                |
| 8. The Schurovo . . . . .                  | 45,000                 |
| Total . . .                                | 920,000                |

According to the data for 1892 the production of these eight factories increased to one million casks, that is, over ten million pouds, or about 164,000 metric tons of Portland cement. The production for the present year may, from private information, be estimated at not less than eleven million pouds. It is also known from private sources that, in 1890, these eight works produced about 700,000 casks, or 7,000,000 pouds of Portland cement. The official statistics of the internal production do not separate

\* Regulations and normals legal for the Russian cement industry, see besides Russian official sources, the protocol of the 15th general meeting of the German Portland Cement Work Union, from the 26th to the 27th Februry, 1892.

cements from burnt lime and alabaster, and therefore do not give a further insight into the gradual growth of the Russian cement production. The gradual increase of the output of Portland cement may be seen from the example of the most striking centres of its manufacture, the Riga and Novorossisk works.

The figures in the following table are taken from the accounts of the works, showing the production of the Riga cement factories.

| Y E A R S.    | PORTLAND CEMENT. | ROMAN CEMENT. | Y E A R S.    | PORTLAND CEMENT. | ROMAN CEMENT. |
|---------------|------------------|---------------|---------------|------------------|---------------|
|               | Barrels.         |               |               | Barrels.         |               |
| 1868. . . . . | 1,743            | 2,000         | 1877. . . . . | 64,597           | 6,187         |
| 1869. . . . . | 3,825            | 2,110         | 1878. . . . . | 55,200           | 22,740        |
| 1870. . . . . | 8,674            | 2,010         | 1879. . . . . | 81,931           | 24,716        |
| 1871. . . . . | 16,280           | 9,380         | 1880. . . . . | 84,072           | 20,848        |
| 1872. . . . . | 27,510           | 19,380        | 1881. . . . . | 84,931           | 22,427        |
| 1873. . . . . | 28,851           | 27,530        | 1882. . . . . | 97,742           | 21,250        |
| 1874. . . . . | 39,929           | 6,625         | 1883. . . . . | 111,780          | 28,000        |
| 1875. . . . . | 56,650           | 2,489         | 1884. . . . . | 128,643          | —             |
| 1876. . . . . | 56,252           | 19,953        | 1885. . . . . | 134,079          | —             |

The output of Portland cement from the Novorossisk Cement Works:

|               |                 |               |                   |
|---------------|-----------------|---------------|-------------------|
| 1883. . . . . | 486,178 pounds. | 1887. . . . . | 1,418,618 pounds. |
| 1884. . . . . | 541,194 »       | 1888. . . . . | 1,672,024 »       |
| 1885. . . . . | 683,609 »       | 1889. . . . . | 1,374,529 »       |
| 1886. . . . . | 963,608 »       | 1890. . . . . | 1,521,880 »       |

The production of Roman cement is carried on at certain of the above mentioned factories, and besides the three special Roman cement works beforementioned, at several other partially rural industries. Thus in 1891, the station of Podolsk on the Moscow-Kursk Railway dispatched 3,417 cars of Roman cement, 1,759 of which were from the Podolsk cement works of the Moscow Joint-Stock Company, and the remainder from eight other small works in the neighbourhood of Moscow. The production of Roman cement varies according to the market, to a somewhat considerable extent, as is seen from the preceding table on the output of the Riga works; and its relative yearly amount can only be given approximately at 300 to 450 thousand barrels for all the factories together.

Such a production as ten million pounds of Portland cement per annum is naturally small in comparison to that of those countries which have an export cement trade, such as Germany. The German production of Portland cement, which was established towards the middle of the sixties, increased with unwonted rapidity, and in 1878 reached to more than 2,500,000 barrels, or twice as much as the present Russian output; in 1886 the 48 works forming the «Union of the German Cement Works»

produced 5,500,000 barrels, or 926,000 tons; in 1890 over 9,000,000, and in 1892, 79 works produced almost 12,000,000 barrels of Portland cement, not counting Roman cement. With such a vast production in the adjacent countries, Russia cannot, naturally, count upon an export trade in its cement, all the more so as the climatic conditions, scarcity of capital and the feeble development of the home production of those machines which are indispensable in the manufacture, place it for the present under comparatively very unfavourable conditions for an external competition with the huge production of other countries.

The machine plant of the Russian cement works is for the greater part supplied by Nagel and Kemp in Hamburg, and Pallenberg in Mannheim. So long, however, as the production of the Russian cement works is only destined for the satisfaction of the home demands, facts show that its present amount of 10 to 11 million pouds of Portland cement, and about 3 million pouds of Roman cement, in all 13 to 14 million pouds per annum, very nearly approaches the limit which would satisfy the home demand, and entirely correspond to the scale of the present development of the building activity in Russia. The importation of foreign cement, which only lately had so important an influence on the home industry, now only plays a secondary role in the general supply of the country. The fall of the foreign importation, and the increase of the Russian production, are connected with the protective system of customs policy; but in this instance the connection is not so direct as in many other cases, partly because the amount of the protective duties in force until 1881 was insufficient, owing to the great difference between the cost of the Russian and foreign cements at the places of their manufacture. The first large Russian factory, besides the Grozdetsk, which was placed under special conditions of sale, as well as the Riga and Port Kunda works, were established at the time when foreign cement was still imported into Russia free of duty. In 1873, a duty of 3 kopecks paper was placed upon cement of all kinds, except that sent to the southern parts of the Black and Azov seas. In fixing this duty the State Council pronounced the following opinion: <That with the present competition of foreign cement manufacturers importing their product free of duty, not only is the further development of the Russian industry impeded, but the existing Russian works might at any time be obliged to close their doors, in the case of a temporary agreement between the foreign works to lower their prices. And if the Russian works ever cease working, they would scarcely be in a position to begin again, and the price of cement would increase irrevocably>. (Imperially confirmed opinion of the State Council, 16th January, 1873).

From 1877 the duty formed, counting the exchange upon gold, on the average four and one-half kopecks paper per pound. In 1881 the duty upon cement, for all ports, was raised to 7 kopecks gold, and in 1885, to 9 kopecks gold per pound; and lastly, in the present tariff of 1891, the duty was placed at 10 kopecks per pound, with a view of further protecting certain special cases, such as the Polish works. Under the influence of the protective duty of 9 kopecks per pound, the output of the Russian factories has indeed recently undergone a very rapid increase, and at the present moment they are occupied in taking measures for further increasing their production; for instance, the Port Kunda works are now erecting the necessary plant for doubling their present yield of 150,000 barrels per year. They estimate their output in 1893 at 150,000 barrels, as against 120,000 in 1891. According to

information received from the St. Petersburg representatives of the Port Kunda works, the Riga factory of Schmidt and Co. estimates its production for 1893 at about 170,000 barrels. No builder will think it exaggerated to say that the manufacture and use of cement are connected, as an accessory to the building industry for which it forms an indispensable material, with the civil and political welfare of the country; and therefore, the considerable rise made in the duty upon imported cement could only be justifiable at a time like 1885, when it was evident, from the appearance of a sixth, seventh, and eighth Portland cement factory at Novorossisk, St. Petersburg, and in Poland respectively, that the industry would be firmly and ultimately established in the country. And this fact has not been long in being proved; at the present time, after a lapse of seven years, since the enforcement of the 9 kopecks protective duty, the country witnesses the full development of the Russian cement industry. According to official data respecting the production of lime, cement, and alabaster, it may be concluded that the production of cement in Russia in 1885 was 600,000 barrels, or almost half of the present output.

IMPORTATION OF CEMENT THROUGH ALL THE RUSSIAN FRONTIERS.

| Y E A R S.     | POUDS.    | VALUE IN<br>ROUBLES. |
|----------------|-----------|----------------------|
| 1872 . . . . . | 1,411,000 | 1,742,000            |
| 1873 . . . . . | 1,898,000 | 1,335,000            |
| 1874 . . . . . | 2,105,000 | 1,531,000            |
| 1875 . . . . . | 2,629,000 | 1,602,000            |
| 1876 . . . . . | 2,452,000 | 1,602,000            |
| 1877 . . . . . | 1,485,000 | 767,000              |
| 1878 . . . . . | 2,210,000 | 1,234,000            |
| 1879 . . . . . | 3,027,000 | 1,440,000            |
| 1880 . . . . . | 3,350,000 | 1,605,000            |
| 1881 . . . . . | 2,006,000 | 1,293,000            |
| 1882 . . . . . | 1,535,000 | 853,000              |
| 1883 . . . . . | 2,977,000 | 1,003,000            |
| 1884 . . . . . | 3,262,000 | 2,035,000            |
| 1885 . . . . . | 2,365,000 | 1,546,000            |
| 1886 . . . . . | 1,701,000 | 930,000              |
| 1887 . . . . . | 1,827,000 | 948,000              |
| 1888 . . . . . | 804,000   | 479,000              |
| 1889 . . . . . | 891,000   | 568,000              |
| 1890 . . . . . | 1,210,000 | 690,000              |
| 1891 . . . . . | 1,058,000 | 534,000              |
| 1892 . . . . . | 2,500,000 | 1,250,000*           |

\* Across the European frontiers only.

The importation of goods analogous to cement cannot in general present figures progressively increasing or decreasing with the course of years; therefore, it is very difficult to give a representation of the development of the internal production of the country to which this importation was directed. The independent Russian industry could only admit, in the calculations for its future growth, that amount of the demand for cement which could be regarded as the true average for several years; moreover, the character of the building season varies every year, and therefore the demand for cement is subject to considerable fluctuations, depending upon the variations of the work during the building season. In cases of an unexpected increase in the demand at a certain moment, the importation of foreign cement may appear in the quality of a balance for the Russian markets. And these somewhat sharp and accidental fluctuations reflect themselves on the figures of the imports, notwithstanding the successive growth of the internal Russian production. The preceding table gives the amount of the importation of cement, and almost exclusively of Portland cement, into Russia from 1872. Up to 1882 the statistics of the imports include lime, after which the cements are put separately from other building materials.

The total annual consumption of cements in Russia thus amounts to 14 million pouds of home manufacture, and taking the average for the last 7 years, about one and one-half million pouds of imported cement, altogether to the sum of nearly 7 million roubles paper.

The quality of the Russian Portland cement has long been recognized as equal to that of the best foreign makes, such as the English and the German. This can be stated now with firm conviction, since the testing and reception of the cement for Government works and private builders, has acquired its present state of per-

| Y E A R S.     | PORTLAND CEMENT IN<br>BARRELS OF 10 <sup>1</sup> / <sub>2</sub> POUNDS<br>NET. | ROMAN CEMENT IN BAR-<br>RELS OF 7 TO 7 <sup>1</sup> / <sub>4</sub> POUNDS<br>NET. |
|----------------|--|---|
| 1868 . . . . . | 5.50 roubles paper.  | 2.25 roubles paper. .   |
| 1869 . . . . . | 5.25 » »   | 2.25 » »  |
| 1870 . . . . . | 4.00 » »   | 2.10 » »  |
| 1871 . . . . . | 3.75 » »   | 1.80 » »  |
| 1872 . . . . . | 4.00 » »   | 2.20 » »  |
| 1873 . . . . . | 4.75 » »   | 2.50 » »  |
| 1874 . . . . . | 4.50 » »   | 2.25 » »  |
| 1875 . . . . . | 4.50 » »   | 1.80 » »  |
| 1876 . . . . . | 4.75 » »   | 2.25 » »  |
| 1877 . . . . . | 5.25 » »   | 2.25 » »  |
| 1878 . . . . . | 5.75 » »   | 2.50 » »  |
| 1879 . . . . . | 5.50 » »   | 2.50 » »  |
| 1880 . . . . . | 5.25 » »   | 2.50 » »  |
| 1881 . . . . . | 5.25 » »   | 2.50 » »  |
| 1882 . . . . . | 5.25 » »   | 2.50 » »  |



fection, being carried on in the mechanical laboratory of the Institute of Civil Engineers of the Emperor Alexander I, under the direction of Prof. A. A. Belebubsky, whose scientific works and railway bridges are well known abroad. This laboratory has sent to the Columbian Exposition at Chicago a collection of data and specimens which cannot fail to interest foreign engineers, and will serve as a capital supplement to all that is already known by them, concerning the work done by this St. Petersburg Institute, and which is so important to Russia.

As regards the price of the Russian Portland and Roman cements, the following table, giving the prices of cement at the Riga works at various periods, may be taken as the normal for the internal production.

The average price for fourteen years is thus 4.85 roubles per barrel of Portland cement, and 2.26 roubles per barrel of Roman cement. At the present time the average prices remain approximately the same, or slightly lower; thus, in 1890 Portland cement cost 4.75 roubles per barrel, and Roman 1.85 per barrel of about 7 pounds; and in May, 1893, the price of Portland cement was 4.70 roubles; in the case of large orders a considerable deduction is made.

The average price of Portland cement per poud, including barrels, is thus 45 to 46 kopecks paper, or about 30 kopecks gold, which corresponds to about 60 shillings per English ton, or 73 francs per metric ton. On comparing these prices with those of foreign cements imported to Russia, and including the customs duty, it is found that the Russian cement works do not take advantage of the full difference of 9 or 10 kopecks, which is given by the customs duty upon the foreign article, but that they only appropriate a portion of this difference. This not unimportant circumstance indicates the growth in recent years of a considerable home competition between the Russian producers; and this again confirms the fact that the Russian cement industry has already, under the protective system of customs tariffs, obtained the desired development, and is now firmly established in all its independent branches.



THE  
INDUSTRIES OF RUSSIA



214028

MANUFACTURES AND TRADE

WITH A GENERAL INDUSTRIAL MAP

BY THE

DEPARTMENT OF TRADE AND MANUFACTURES MINISTRY OF FINANCE

FOR THE

WORLD'S COLUMBIAN EXPOSITION

AT

CHICAGO

EDITOR OF THE ENGLISH TRANSLATION

**JOHN MARTIN CRAWFORD**

U S CONSUL GENERAL TO RUSSIA

Vol II

ST PETERSBURG

1898

Published by the Department of Trade and Manufactures Imperial Ministry of Finance.

TRENKE & FUSNOT, Printers, Maksimilianovsky Per., 13.

## INDEX OF AUTHORS

AND

## CONTENTS.

|   | Page. |
|---|-------|
| ◀CHAPTER XVII. <b>Sugar Manufacture</b> , by W. N. Andréev, Reviser of the Department of Unassessed Taxes . . . . .   | 281   |
| Historical review; cultivation of beet; quantity of sugar produced; number of workmen; fluctuation of prices; consumption at home; export; excise revenue.  |       |
| ◀CHAPTER XVIII. <b>The distillation of spirits</b> , by W. N. Andréev, Reviser of the Department of Unassessed Taxes . . . . .  | 303   |
| Historical review of the Government measures respecting the alcoholic industries; present position of the industry; rectification of spirits; vodka; consumption of spirits; its exportation; production of yeast; beer and mead brewing. |       |
| ◀CHAPTER XIX. <b>Tobacco Industry</b> , by L. P. Vessine, Chief of Section, Department of Unassessed Taxes . . . . .  |       |
| Quantity and quality of tobacco; principal centres of tobacco manufacture makhorka; import and export.  |       |
| ◀CHAPTER XX. <b>Food products</b> . . . . .   | 348   |
| <b>Grain flour and groats</b> , by P. A. Afanassiev, Professor, St. Petersburg Technological Institute.   |       |
| Historical remarks; steam mills; methods of grinding; cost of grinding; production and export of flour and bran; production of groats.  |       |
| <b>Manufacture of oils</b> , by L. P. Vessine, Chief of Section, Department of Unassessed Taxes.  |       |
| Production of tallow; manufacture of candles; making of soap; import and export of animal fats; production of different vegetable oils, their export and import.  |       |

|  | Page- |
|--|-------|
| <b>CHAPTER XXI. Ship building and navigation</b> , by N. A. Krylov, member of the Company of Concurrency to Russian Trade Navigation. . . . .  | 366   |
| The waters of Russia; freight vessels exclusive of steamers; river steamers; the Merchant Sea Fleet; the merchant fleet of Finland; building of war-ships.   |       |
| <b>CHAPTER XXII. Carriage Manufactures</b> , by K. K. Nellis, Member of the Council of Trade and Manufacture. . . . .  | 396   |
| Historical remarks; india-rubber tires; import of foreign equipages; home manufacture of carriages.  |       |
| <b>CHAPTER XXIII. Review of the Russian Customs Tariff Systems</b> , by W. I. Timiriazev, Vice-Director, Department of Trade and Manufactures . . . . .  | 405   |
| Fluctuations in the customs tariff system; changes made in the tariff policy; first period, 1822 to 1849; second period, 1850 to 1870; third period, 1877 to 1891; fourth period, the tariff of 1891.  |       |
| <b>CHAPTER XXIV. Review of foreign trade</b> , by A. I. Stein, Director of the Statistical Section, Department of Customs Duties . . . . .   | 440   |
| General and special trade of the Empire; foreign trade of European Russia; import and export through the principal customhouses; distribution of goods by countries; external trade of Asiatic Russia; trade with Finland; trade at the mouths of the Pechora, Obi and Yenisei; transit trade; coasting trade. |       |
| <b>CHAPTER XXV. The interior trade and fairs of Russia</b> , by N. I. Samoilovich and A. W. Bouniakovski, Department of Trade and Manufactures . . . . .   | 478   |
| Objects of the interior trade; dimension of turnover; fairs, their number and turnover; historical remarks and laws concerning fairs; the principal fairs.   |       |
| <b>CHAPTER XXVI. The consumption of fuel for industrial purposes</b> , by S. O. Goulishambarov, Technological Engineer . . . . .   | 495   |
| Different sorts of fuel, peat, straw, pit coal, naphtha; consumption of fuel in factories; consumption of wood in mining works; fuel consumed in iron, steel and salt works; on railroads; on river steamers; on sea vessels; totals.  |       |
| <b>CHAPTER XXVII. Wages and working hours in factories</b> , by J. T. Mikhailovski, Chief Inspector of Factories. . . . .  | 514   |
| Yearly average wages; economic position of Russian workmen; lodgings in factories; board; shops; statutes concerning workmen and their masters; factory inspection; duration of the working day; number of working days.   |       |
| <b>CHAPTER XXVIII. Data showing the wages paid to workmen in factories</b> , by J. T. Mikhailovski, Chief Inspector of Factories . . . . .   | 525   |
| Cotton manufacture; wool manufactories; silk manufactories; wood manufactories; iron and steel works; glass works; tobacco manufactures; leather manufacture and others.   |       |
| <b>CHAPTER XXIX. The Industries of the Grand Duchy of Finland</b> , by the State Secretary Office of the Grand Duchy of Finland. . . . .   | 539   |
| General review; mining and metallurgical industry; cloth industry; timber; chemical industry; pottery and stone hewing; foodstuffs; leather; writing paper; graphic industries; foreign trade; customs tariffs; water ways and railroads.  |       |



## CHAPTER XVII.

## The Beet Sugar Industry.

**T**HE beet sugar industry began in Russia almost simultaneously with its appearance in Western Europe, namely at the very commencement of the present century. The first beet sugar manufactory in Russia was built in 1802 by General Blankenagel in the village of Alabiev in the government of Tula, and received from the Government considerable support in the shape of a loan of fifty thousands roubles for twenty years made to the founder, to be paid off in sums of ten thousand roubles with interest during the last ten years. He also received permission to sell up to one thousand vedros of spirit obtained from beet sirup with no limitation as to price. Several other manufactories were established upon the same basis. But all of them were till the beginning of the thirties at a very low level of technical perfection; they possessed neither proper apparatus nor skilled workmen. Beet sugar manufactories were established exclusively by landowners and bore the character of an auxiliary article in the economy of great estates, as the cultivation of beet and the extraction of sugar therefrom appeared as an important element especially upon the estates of landowners. But until 1834 the output of these manufactories, on account of their extremely unsatisfactory arrangement was very inconsiderable. Moreover, they were employed not so much in the manufacture of sugar as in the distillation of spirit from beet molasses. Only since 1834 the production of the manufactories began to increase, with the appearance of sugar bakers acquainted with the process. At this time a Committee of Sugar Bakers was formed in the Moscow Agricultural Society, upon the proposition of the founder, Mr. Maslov. One of the sugar refiners, Davydov, there shewed his method of cold soaking of beet, which was destined to take the place of the squeezing out of the juice by means of presses. Soon afterwards, the clarification of beet juice by bullock blood was abandoned, and bone charcoal introduced in its place.

The spread of information upon the production of beet sugar and the improvement of the technical part of the business derived great advantage from such workers as Maltsev, Count Bobrinsky, Shishkov, Maslov and Davydov referred to above,

and a few others. At the same time a powerful impulse was given to the development of the beet sugar industry by the protective tariff to which the Government had recourse as early as 1825. The importance of this measure was greatly strengthened in 1841, when the bringing of colonial raw sugar by land was absolutely prohibited, and a duty of 3.80 roubles a poud imposed upon sugar brought by sea. The number of refineries increased every year and in 1844 and 1845 there were already 206 in operation in the Empire, while the quantity of raw sugar obtained by them amounted to 484,136 pouds, for the production of which 1,161,492 berkovets of beet were treated, answering to an average yield of 4.17 per cent, or about 16.7 pounds per berkovets.

Yet, however insignificant was the scarcely begun production, and however little it satisfied the home demand, a desire was expressed to establish a tax upon it. A proposition to this effect arose originally in 1839, and in 1841 it was presented in due legislative course, but was rejected by the Council of State. Afterwards in 1844 the same question was again raised in consequence of the agitation of the refiners who in view of the decreased import of colonial sugar petitioned at first for the lowering of the duty upon it. When subsequently, in 1847, the number of beet sugar manufactories exceeded 300, yielding as much as 800 thousand pouds of raw sugar, the refiners began, at the same time that they strove to exact the lowering of the duty upon foreign sugar, to insist upon the taxing also of sugar of home production. This tax was in fact established in 1848 in the form of an excise upon the quantity of raw sugar obtained in the beet sugar manufactories and the payment of licenses to run such manufactories. The quantity of raw sugar subject to excise was determined by legalized scales of its yield from the beet and by the production of the apparatus used for the obtaining of the juice in the twenty-four hours, and also by the number of working days in the factories. The scales of yield and work by the apparatus in twenty-four hours were taken very moderate, namely. 12 pounds of raw sugar per berkovets of beet that is, 3 per cent, the amount of excise being fixed at 30 kopecks per poud of estimated sugar, with continuous raising of the same every two years until September 1, 1854, by 15 kopecks, and with certain privileges for small and newly established manufactories. The payment for the right of carrying on the industry was fixed at 3 to 50 roubles a year, according to the quantity of raw sugar which the manufactory might be able to produce in the course of a hundred working days.

Simultaneously with the publication of the statute upon excise from home produced sugar in 1848, a special inspection of manufactories was instituted, whose duty it was to collect every kind of information and statistical data upon the beet sugar industry. Upon the basis of these data, during the period 1848, 1849, there were in twenty-three governments of the Empire, 340 works among which were 300 oven factories and only 40 were provided with steam. They treated 897,457 berkovets of beet and an estimated total of 269,234 pouds of raw sugar subject to excise. During the same period the importation of foreign sugar, raw and refined, amounted to 1,815,682 pouds. In the subsequent periods an increase took place both in the number of manufactories and in the quantity of beet sugar treated by them. During the period 1854 to 1855 there were already reckoned to be 395 manufactories, among which were 307 oven factories, and 88 steam. The quantity of beet treated by them was

estimated at 2,651,160 berkovets, and the normal production of raw sugar therefrom amounted to 795,561 pounds. The importation of foreign sugar was for the same period 1,130,442 pounds, 984,441 pounds of raw sugar and 144,001 pounds of refined. Simultaneously important advances were made also in the technical arrangement of the steam beet sugar manufactories, to which contributed among other things the establishment in the centres of the beet sugar industry of several machine works and the publication of guides to the industry.

In the next period of twenty-five years, 1855 to 1881, the situation of the beet sugar industry in Russia changed in all respects. It gained strength, developed and attained such dimensions that the country began to occupy a prominent position among the other countries of Europe, where the industry was earlier planted than in Russia. During the twenty-five year period under consideration, in the history of the beet sugar industry two epochs come prominently out, sharply distinguished from each other: the former was comprised between 1855 and 1864, and the latter from the last-named year. During the first period the number of manufactories, although increasing at first and reaching 432 in 1860, fell in 1864 to 402. The industry amounting to the annual treatment of 2 to 4 million berkovets of beet, was not so much a manufacturing as a rural industry. In 1861, following upon the peasant reform, came a crisis in the industry as in other spheres of activity, which resulted in the closing of several small rural manufactories and a certain decrease in the production. This crisis was however passed by the beet sugar industry in the course of only two years, and afterwards in 1864 to 1865 the manufactories began to become the enterprises of capitalists attracting men and means. The stock associations so formed, beginning with 1866, having collected considerable resources rapidly raised anew the beet industry, so that at the end of the period under consideration the oven manufactories were replaced by improved steam works. Compared with 307 oven manufactories at work in 1855 to 1856, there were in 1879 to 1880 out of a total of 199 only 4, and they were an improvement upon the previous system in that they worked with half-steam. At the same time the area occupied by beet plantations was extended. The treatment of beet root increased from 2,105,629 berkovets in 1855 to 1856 to 14,219,981 berkovets in 1879 to 1880, and the yield of sugar grew from 795,561 pounds, according to the established scale, to 12,544,628, according to the declarations of the sugar bakers. As a matter of fact the average amount of the annual production of sugar, according to the observations of the technical engineers of the Ministry of Finance, considerably exceeded the declarations of the sugar bakers and formed not less than 15,600,000 pounds. Native sugar not only finally drove out imported sugar but began to form an article of export.

While protecting the native beet sugar industry, the Government yet became convinced that the excise even as fixed at 60 kopecks a pound, as it continued to be levied till 1854, in no way expressed the actual tax falling upon the product in question. At the same time it appeared that the treasury suffered considerable losses also from the privileges granted in the payment of excise, in forms of new and recently established manufactories, while these same privileges, securing special advantages to the promoters, called forth the foundation of manufactories even in such localities where neither the conditions of soil nor climate in any way favoured the



establishment of the industry. Hence it was that the defects discovered in the statute of 1848 incited the Government to review the rules that were in force and to issue in the year 1863 a new statute. While preserving the fundamental principles of the system that had hitherto had force in taxing the beet sugar industry, the new statute introduced partial changes merely in respect to the two chief bases of the calculation, namely, the scale of production of sugar and the twenty-four hours work of the sirup-producing apparatus, with the object as far as possible of bringing these theoretical measurements into harmony with fact by means of raising those that had previously existed. In this way the average yield of raw sugar per berkovets of beet, according to the new statute was defined as of different amount according to the method of concentrating the beet sirup; in other words, when the concentration was effected by steam in an apparatus supplied with a vacuum the yield was defined as 6 per cent of the beet employed; when on the other hand, the concentration was effected without such an apparatus by the direct application of the fire combined with steam or only by steam, at 5 per cent; or finally, by concentration by fire alone at 4.5 per cent. In reference to the appliances used in the production of sirup, besides a considerable raising of the scale for twenty-four hours work, new indications were adopted by which their productive capacity was to be determined in the calculation. At the same time scales were instituted for apparatus of which no mention at all was made in the former statute, namely, for the so-called centrifugal apparatus or turbines.

In consequence of the considerable raising of the scale used in estimating the production, which was fixed to remain in force till August 1, 1869, it was thought best to reduce the amount of excise, 60 kopecks per pound of raw sugar that had existed till then, and to levy from May 1, 1864 till August 1, 1866, 20 kopecks, and thereafter, 30 kopecks per pound. Moreover, the statute of 1863 absolutely abolished the privileges existing in reference to the payment of excise, which had been granted to newly built or rebuilt manufactories, and at the same time a special inspection of manufactories was established by the Government, consisting of 12 inspectors, a technical engineer and three other officials.

On August 1, 1867, came into force a rise in the excise to 50 kopecks per pound of raw sugar, with the condition that, if the revenue to the treasury from both imported and native sugar in 1868 and 1869 should not reach on an average, 6,500,000 roubles, from August 1, 1870 to August 1, 1872, the excise should be levied at 70 kopecks a pound.

Simultaneously with the raising in 1867 of the excise to 50 kopecks a pound, the distinction, existing till that period, in the taxing of the beet sugar industry in the Polish region and in the remaining portions of the Empire was abolished. This difference consisted mainly in the fact that the standard of the twenty-four hours yield of the sirup-producing apparatus for the Polish region was lower than in the other districts. By the rules of June 16, 1867, were established uniform standards and an identical amount of excise for the whole Empire.

As with the 50 kopecks excise the revenue to the treasury from the taxing of sugar of home production and from the duty upon imported sugar proved less than half the anticipated sum of 6,500,000 roubles, from 1870 the excise was raised to 70 kopecks per pound, but the standards defined by the statute of 1863 remained at the

same time unchanged till 1872, when they were raised in consequence of the fact that in the manufactories not only did the former apparatus act more advantageously, but diffusors were already in operation whose normal work was not yet determined.

By the law of June 10, 1872, it was laid down that if, with the excise of 70 kopecks a poud, the revenue from the taxation of home sugar and from the customs duties upon imported sugar should not reach an average for 1873 and 1874 of 4,400,000 roubles, for 1875 and 1876, 5,000,000 roubles and for 1877 and 1878 6,500,000 roubles, then from August of the year following each of these periods, the Minister of Finance, might raise the excise according to his discretion, but not to exceed 90 kopecks a poud. By the same law in the determination of the standards used in estimating, beyond the difference in the work of the various apparatus, the climatic and economical conditions of the localities of the industry were taken into account. In this way according to their situation all the governments where there were sugar manufactories were divided into three regions. To the first region were reckoned the governments of Kiev, Podolsk, Volynia, Bessarabia and Poland; to the second, the governments of Kharkov, Poltava, Voronezh and parts of Kursk and Chernigov; to the third, all the remaining localities. In reference to arrangement, a distinction was established among the manufactories in respect to the more or less perfect extraction of the sirup and the perfection of the concentrating apparatus. Among the apparatus for the complete extraction of the sirup are reckoned especially all the appliances for soaking and diffusion; but at that time the most widely extended hydraulic presses were recognized as apparatus of less perfect extraction of the sirup, if they did not possess graters and soaking cylinders for the grating and soaking of the already once squeezed residue. Concentrating apparatus with vacuum were regarded as belonging to the class of improved appliances. Finally, manufactories were distinguished as factories proper and rural works. Among the latter were reckoned such as had not more than two hydraulic presses of accelerated action, or other apparatus whose total work corresponded to that of two such presses. The standards of yield from beet, according to the regions, the above indicated subdivision of manufactories and the degree of their perfection, were defined as follows: for the first region 7·5, 7 and 6·5 per cent; for the second 7, 6·5 and 6; and for the third 6·5, 6 and 5·5 per cent of the weight of the root. In reference to the principal sirup-producing appliances at that time, steam hydraulic presses and diffusors, the standards of twenty-four hours treatment of beet root were fixed for presses from August 1, 1872 till August 1, 1879, with a gradual rise after each three years, at 75, 85 and 105 berkovets; for diffusors, at 7 berkovets per 100 vedros of the cubic contents of the apparatus till August 1, 1875. Subsequently the standard for the diffusors was raised, first till August 1, 1876, to 13 berkovets, and then till August 1, 1879, to 16 berkovets per 100 vedros of contents.

In 1875 the excise was raised from 70 to 80 kopecks per poud of raw sugar. But in fact. the tax did not exceed 45 kopecks per poud, forming on an average 35 kopecks and even in individual cases not more than 20 kopecks, for the actual yield surpassed the fixed standards in manufactories provided with presses by nearly 202 per cent, and in those with diffusors, by 115 per cent. Hence in 1879 with a view to increase the revenue from the taxation of home produced sugar the standards were again raised on an average by 66 per cent, at the same time the calculation of

the 24 hours work of the apparatus was changed. In the case of hydraulic presses it was determined to calculate it according to the number of cubic foot of press space, as 11·13, 6·8, 6 and 3·43 berkovets per cubic foot in the 24 hours, taking account of the construction and rapidity of action of the presses. For diffusion was chosen as a unit, a capacity of 100 vedros of the whole diffuser battery, according to a special table, assigning to the said capacity a greater quantity of sliced beet, the less the dimensions of the separate diffusers; for example, with a capacity of 50 vedros, 30 berkovets; 100 vedros, 27·9 berkovets; 200 vedros, 25 berkovets, and so on. However, even with the establishment of new standards there again appeared a danger of diminished revenue because the sugar bakers hastened to introduce small diffusers even before the bill received the Imperial consent. Their production considerably surpassed that increase in the standard of their supposed work, compared with the large diffusers, which had been assumed by the law of May 15, 1879. Thus, by the introduction of small diffusers it proved possible to reduce the amount of excise paid 30 to 60 per cent, as compared with that under the former standards, so that a considerable percentage of sugar escaped the payment of excise.

Under a complete system of protection on the part of the Government, partly in the form of extremely favourable standards in the calculation of taxation, and partly in that of high customs duties upon imported sugar \*, privileges of yet another kind were shown to the beet sugar industry, aiming at facilitating the export of the surplus of sugar on the home markets. Thus, in 1876 it was resolved to return the excise upon exported sugar at a nominal rate, that is, at 80 kopecks per pound, where as a matter of fact the excise then incident upon sugar proved in all, 20 to 25 kopecks a pound. In this way the draw-back, exceeding almost four times the excise actually paid by the sugar bakers, amounted to a high premium upon exportation. A consequence of this measure was a considerable increase in the export of sugar, which rose from 4 pounds in 1874 to 3,896,902 pounds in 1877, in consequence of which more than 3 million roubles of excise were returned as draw-backs, or almost half of the total excise then received by the treasury from sugar, namely, 6,616,048 roubles.

In reference to the production of sugar in the manufactories, the essential reform at the end of the period of twenty-five years under consideration resulted in a change in the processes adopted in obtaining sirup from the beet, namely, in the transformation of the majority of beet sugar manufactories from the press system to that of diffusers.

Out of the total number of 250 manufactories working during 1879 and 1880 already two-thirds were employing the diffusion process. With such successes in the technical part of the beet sugar industry, pursuing mainly one object only, the diminution of the excise payable by the manufactories, the equitable taxation of manu-

---

\* Although by the law of June 2, 1872, simultaneously with the alteration of the standards of excise for sugar of home manufacture, it was decreed to levy upon foreign sugar during the six years period from 1873 to 1878 customs duties in a continually diminishing amount, namely, upon raw sugar, 2 to 2·50 roubles, and upon refined, 3 to 3·50 roubles per pound, with the object of regulating the prices of sugar upon the markets; nevertheless the lowest of these duties, 2 roubles and 3 roubles, proved so high that the importation of foreign sugar into Russia in 1878 was expressed by the insignificant quantity of 650 pounds.

factories of different kinds, which the law of 1879 had in view, alike in the interests of the treasury as in those of the sugar bakers themselves was disturbed.

In consequence of this, although it was determined, in order to save the beet sugar industry from fluctuation, to present the standards for calculating excise without radical changes during six years, 1880 to 1886, with only a slight raising of the standards of twenty-four hours work of hydraulic presses and diffusors for the period, August 1, 1883, to August 1, 1886, the Government found it necessary to have recourse to a radical alteration in the system of taxing beet sugar, by passing to the levying of excise upon the actual quantity of the article manufactured. This was achieved by the law of February 3, 1881, which directed that the excise upon sugar should be levied upon the quantity thereof as ascertained by weighing, at the following rate: from August 1, 1881 to August 1, 1883, 50 kopecks, and from August 1, 1883, to August 1, 1886, 65 kopecks per pound of raw sugar. The detailed regulations upon this subject were confirmed May 12, 1881, and put into operation on the 1st of August of the same year, throughout the whole Empire.

The essence of these rules consists in the following: the tax upon the sugar industry is composed as before of two kinds of duties, namely, that upon licenses giving the right to engage in the industry, and the excise proper upon the sugar manufactured; the calculation of the excise due to the treasury is based upon the quantity of sugar turned out by the manufactory as determined by weighing; in the case of beet sugar refineries where the obtaining of raw sugar and its refining are united in one building, or in buildings contiguous to each other, the excise is calculated by the weight of refined sugar and molasses in sugar loafs together with paper and string; the excise upon sugar in pieces is levied on the net weight. On the exportation of sugar the excise paid upon it is returned in full. The license duty on the right to carry on the industry is exacted at the rate of 5 roubles per thousand pouds of sugar manufactured.

The principles of the taxation of beet sugar established by the rules of May 12, 1881, remain in force at the present time. The subsequent exactments had in view: 1. the fixing of the amount of excise after July 31, 1886, which was done by the law of May 1, 1884, by which the amount of the excise was fixed for the period from August 1, 1886, to August 1, 1889, at 85 kopecks a poud, and from August 1, 1889 onwards, at the rouble a poud; at the same time it was enacted that every new rise of the excise above one rouble should be announced not less than two years in advance. The same law afforded certain privileges in the payment of excise for the first beet sugar manufactories that should be started in the regions of Turkestan, Transcaucasia and in Siberia; 2. the exportation of Russian sugar was encouraged by the temporary payment till July 1, 1886, of special premiums, over and above the draw-backs, upon exported sugar, at first at the rate of one rouble, and afterwards at that of 80 kopecks a poud. This was expressed in the acts of July 12th and November 9th, 1885, and March 30th, 1886. The same exactments provided that the premium paid for sugar exported up to July 1, 1886, to the European markets should be returned by the sugar bakers at the time of paying excise on sugar manufactured in 1885—1886, 1886—1887, 1887—1888, and 1888—1889 by being distributed over every poud of sugar manufactured during those periods in all the manufactories of the Empire; that the sugar exported from May 1, 1886,

till May 1, 1891, into Persia and into the Central Asian markets should enjoy a premium of 80 kopecks a poud without liability to be returned; and that on May 1, 1891, all payment of premiums should cease upon exported sugar; 3. the exchange in the dates assigned for the payment of excise was introduced by the law of February 20, 1889, by which instead of one such date for the payment of excise, the 31st of August, three dates were appointed, namely, June 1st, September 1st, and December 1st, of each year. Furthermore, by the laws of May 1, 1890, and of May 21, 1891, it was enacted that there should be a supplementary excise upon refined sugar and upon sugar prepared in a similar manner, at the rate of 40 kopecks a poud, and at the same time a special tax on licenses for beet sugar refineries of 5 roubles per 1,000 pouds of refined sugar manufactured by them. These two last laws came into force on September 1, 1892, but as on their practical application there appeared certain inconveniences, caused in the main by the insufficient exactness of the tests adopted for different kinds of refined sugar for distinguishing it from unrefined white raw sugar, the latter on account of its high quality hardly yielding to refined, by the latest law of January 12, 1893, it was exacted that the levying of the supplementary excise upon refined sugar should be abolished from September 1, 1894, and that the fundamental excise upon sugar should be raised from the same date to 1.75 roubles per poud.

Before passing to the review of the present condition of the beet sugar industry in Russia it seems appropriate to preface thereto a few of the more important statistical data upon the area of the land under beet cultivation, upon the crop and yield of the plant, upon the number of manufactories at work, upon the quantities of beet used by them and the estimated produce in sugar and the average yield of the same during the last decade, which has passed since the introduction of the system at present in force of taxing sugar.

THE AREA OF LAND UNDER BEET, ITS CROP AND YIELD.

| Y E A R S.     | Area of land<br>under beet. | Total crop of<br>beet in<br>berkovets. | Yield per des-<br>iatine in<br>berkovets. |
|----------------|-----------------------------|--|---|
| 1881 . . . . . | 223,132                     | 22,063,091                             | 96.5                                      |
| 1882 . . . . . | 234,429                     | 23,320,531                             | 98.8                                      |
| 1883 . . . . . | 276,131                     | 22,183,955                             | 80.3                                      |
| 1884 . . . . . | 291,730                     | 24,995,765                             | 85.7                                      |
| 1885 . . . . . | 299,574                     | 34,088,171                             | 113.8                                     |
| 1886 . . . . . | 270,865                     | 28,904,837                             | 106.7                                     |
| 1887 . . . . . | 231,064                     | 26,292,453                             | 113.8                                     |
| 1888 . . . . . | 245,772                     | 28,497,865                             | 115.0                                     |
| 1889 . . . . . | 247,641                     | 26,925,773                             | 108.7                                     |
| 1890 . . . . . | 279,200                     | 30,542,221                             | 109.4                                     |
| 1891 . . . . . | 281,140                     | 26,608,113                             | 94.7                                      |

THE NUMBER OF BEET SUGAR MANUFACTORIES IN ACTION, THE AMOUNT OF BEET USED, THE ESTIMATED PRODUCTION OF SUGAR AND THE AVERAGE YIELD.

| YEARS.              | Number of manufactories. | Quantity of beet used, in berkovets. | Quantity of estimated sugar, in pounds. | Yield of sugar per berkovets of beet. |           |
|---------------------|--------------------------|--------------------------------------|---|---------------------------------------|-----------|
|                     |                          |                                      |   | Lbs.                                  | Per cent. |
| 1881—1882 . . . . . | 235                      | 21,529,965                           | 15,936,714                              | 29.72                                 | 7.43      |
| 1882—1883 . . . . . | 237                      | 22,897,190                           | 17,537,890                              | 30.68                                 | 7.67      |
| 1883—1884 . . . . . | 244                      | 22,149,000                           | 18,759,739                              | 34.40                                 | 8.60      |
| 1884—1885 . . . . . | 245                      | 24,631,238                           | 20,958,120                              | 34.32                                 | 8.58      |
| 1885—1886 . . . . . | 241                      | 33,669,974                           | 29,039,594                              | 34.32                                 | 8.58      |
| 1886—1887 . . . . . | 229                      | 28,734,639                           | 25,949,631                              | 36.52                                 | 9.13      |
| 1887—1888 . . . . . | 218                      | 26,068,419                           | 23,749,028                              | 36.48                                 | 9.12      |
| 1888—1889 . . . . . | 220                      | 28,046,827                           | 28,393,327                              | 40.08                                 | 10.02     |
| 1889—1890 . . . . . | 220                      | 26,703,226                           | 25,606,372                              | 36.64                                 | 9.16      |
| 1890—1891 . . . . . | 223                      | 30,199,018                           | 28,475,431                              | 38.92                                 | 9.73      |

From the extent of production and the value of the produce the beet sugar industry occupies now in Russia one of the most prominent places, the annual output of raw sugar alone, according to the data for the last five years, exceeding 25 million pounds, which at the mean value of a pound of this article, 4 roubles, places the value of the raw sugar industry alone at 100 million roubles. As far as concerns the quantity of sugar annually manufactured, Russia occupies the fourth rank among the other European countries, Germany, France, Austria, Belgium et cetera. where the beet sugar industry exists. At the same time this industry is in Russia in reference to technical matters on as high a level of development as in the countries mentioned, and the raw sugar produced in the Russian manufactories, differing little from refined sugar in its qualities and in the proportion of pure sugar, considerably surpasses in this respect the raw product of the foreign manufactories.

The governments of European Russia may be grouped into three regions according to the situation of the beet sugar manufactories: 1. *South-western*, including the government of Bessarabia, Kiev, Podolia, and Volynia, with the largest number of manufactories, forming about 52.4 per cent of the total number of the latter; 2. The *Central*, into which enter the governments of Voronezh, Ekaterinoslav, Kursk. Orel, Poltava, Samara, Tambov, Tula, Kharkov and Chernigov; these governments contain 29.1 per cent of the total number of sugar manufactories; 3. The *Polish*, containing the governments of Warsaw, Sedlets, Kalish, Petrokov, Liublin, Kelets. Radom, Lomzha and Plotsk with 18 per cent. Outside these regions there is one inconsiderable manufactory in Eastern Siberia, namely, in the government of Yeniseisk, established only in 1888, and which began to operate in 1889. The distribution of the 232 beet sugar bakeries and refineries working in 1890—91, according to regions, the area of land under beet cultivation, the crop of the latter, and the quantity of beet worked up by the manufactories were as follows.

| REGIONS.                            | Manufactories.   |             |        | Land under beet in dessiatines. |           |           | Beet in berkovets.         |               |
|-------------------------------------|------------------|-------------|--------|---------------------------------|-----------|-----------|----------------------------|---------------|
|                                     | Sugar factories. | Refineries. | Total. | Manufactories.                  | Planters. | Total.    | Received at manufactories. | Manufactured. |
| South-western . . .                 | 110              | 7           | 117    | 55,562.1                        | 98,759.2  | 154,321.3 | 17,657,784.3               | 17,609,223    |
| Central . . . . .                   | 61               | 4           | 65     | 56,912.1                        | 31,874.4  | 88,786.5  | 8,281,092.8                | 8,081,460.7   |
| Polish . . . . .                    | 16               | 24          | 40     | 1,815.5                         | 34,260.5  | 36,076    | 4,601,679.4                | 4,507,489.2   |
| Eastern Siberia . .                 | 1                | —           | 1      | 16                              | —         | 16        | 1,665                      | 845           |
| Total . . . . .                     | 188              | 35          | 223    | 114,305.7                       | 164,894.1 | 279,199.8 | 30,542,221.5               | 30,199,018.2  |
| For 1889—1890. .                    | 186              | 35          | 221    | 106,402.8                       | 141,238   | 247,640.8 | 26,925,773.3               | 26,703,225.7  |
| Compared with 1890—1891, less by... | 2                | —           | 2      | 7,902.9                         | 23,656.1  | 31,559    | 3,616,448.2                | 3,495,792.5   |

The average quality of the beet used, the quantity of sugar manufactured and estimated in the form of refined sugar, white and brown moist sugar, and refined treacle, and the yields of white sugar and black treacle corresponding to the beet treated were for the same period as follows.

| REGIONS.                          | Average quality of beet sirup tested by polarization. |                     |          | Quantity of estimated sugar. |           | Quantity of refined sirup. |        | Yield of beet per cent. |           |
|-----------------------------------|---|---------------------|----------|------------------------------|-----------|----------------------------|--------|-------------------------|-----------|
|                                   | Sugar per cent.                                       | Non-sugar per cent. | Quality. | Pouids.                      | Tons.     | Pouids.                    | Tons.  | White sugar.            | Molasses. |
| South-western . .                 | 13.49   | 3.19                | 80.85    | 15,947,171.1                 | 257,068.4 | 5,430.1                    | 86.53  | 9.46                    | 4.31      |
| Central . . . . .                 | 13.63   | 3.64                | 78.94    | 7,575,750.7                  | 122,121.1 | 3,529.2                    | 56.89  | 9.47                    | 4.24      |
| Polish . . . . .                  | 14.81   | 2.57                | 85.20    | 4,952,438.7                  | 79,833.3  | 29.7                       | 0.48   | 11.28                   | 2.12      |
| Total, European Russia. . .       | 13.72   | 3.22                | 80.99    | 28,475,360.5                 | 459,022.8 | 8,989.0                    | 143.90 | 9.73                    | 3.96      |
| Eastern Siberia . .               | 12.30   | 3.05                | 80.13    | 70                           | 1.1       | —                          | —      | 1.92                    | 4.03      |
| For 1889—1890, European Russia. . | 12.68   | 3.06                | 80.56    | 24,606,372                   | 396,655   | 8,053.6                    | 129.82 | 9.16                    | 3.24      |

It appears from these data that the total area of the plantations under beet in 1890 formed 279,199.8 dessiatines (753,839.5 acres), or 31,559 dessiatines (85,209.4 acres) more than in 1889. The plantations connected with the manufactories formed 40.9 per cent of the total area, while the beet growers had 59.1 per cent. Among

the separate regions the most unequal proportion of the two categories of plantations was in the Polish region, in which from a total area of 36,076 dessiatines (97,405.2 acres) the planters had 34,260.5 dessiatines (92,503.3 acres), that is, 95.1 per cent, while the manufactories had only 1,815.5 dessiatines (4,901.8 acres) or 4.9 per cent. In the South-western region the planters crops also predominated, but formed only 64 per cent of the total. In the Central region a quite different status is to be seen: here the plantations belonging to the manufactories predominate, occupying 64.1 per cent of the whole area under beet.

During the years 1882 to 1885 an almost unbroken expanse of the area of beet cultivation was observed, both in respect to the whole Empire and to individual regions. From 234,429 dessiatines (632,958.3 acres) in 1882, the area in question for the whole Empire grew to 299,574 dessiatines (808,849.8 acres) in 1885. This increase was in connexion with the favourable condition of the sugar market and the high prices ruling for sugar, which induced the sugar bakers to enlarge the area of cultivation and to increase the output of sugar. But from 1886 to 1889 in consequence of the standstill in the sugar trade and the insufficient demand for sugar, many manufactories considerably reduced both their own cultivation of beet and their orders for the same to the planters. This was reflected in a corresponding degree upon the area of beet plantations, which in 1886 was reduced to 270,865 dessiatines (731,335.5 acres) and in 1887 even to 231,064 dessiatines (623,872.8 acres), the most considerable reduction taking place in the South-western and Polish regions. In the following years the beet plantations began to be again gradually enlarged, reaching in 1888, 245,772 dessiatines (663,584.4 acres), in 1889, 247,641 dessiatines (668,628 acres), in 1890, 279,200 dessiatines (753,840 acres), in 1891 even 285,017 dessiatines (769,546 acres). Of the latter area there was left on September 1st, actually under beet, only 281,140 dessiatines (759,078 acres), among which belonging to manufactories were 117,369 dessiatines (316,896.3 acres) or 41.6 per cent, the remaining 163,771 dessiatines (442,181.7 acres), that is, 58.4 per cent belonging to planters.

The crop of beet in 1890, was 30,542,221.5 berkovets from 279,200 dessiatines (5,023,164.3 tons, from 753,840 acres), the average yield per dessiatine being 109.4 berkovets (6.66 tons per acre), while in 1889 each dessiatine gave on an average 108.7 berkovets (6.5 tons per acre). The highest yield was attained in the Polish region, namely, 127.6 berkovets per dessiatine (7.61 tons per acre), instead of 105.7 berkovets, or 6.31 tons, in 1889. Still lower was the result in the South-western region, 114.4 berkovets per dessiatine, or 6.83 tons per acre, while in 1889 the crop was 108.6 berkovets or 6.5 tons. The lowest yield of all was reached in the central region, where only 93.3 berkovets or 5.56 tons were obtained, while in 1889 the crop gave 110 berkovets per dessiatine or 6.56 tons per acre.

In 1891 the total crop of beet from 281,140 dessiatines (759,078 acres) was 26,608,113 berkovets (4,289,227.8 tons), consequently 3,934,108.5 berkovets or 634.178 tons or 13 per cent less than the crop of the previous year. The average yield per dessiatine was 94.7 berkovets (5.65 tons per acre), that is, 14.7 berkovets less than the crop of 1890.

From 1882 to 1890 the average crops of beet per dessiatine in each of the mentioned regions varied within the following limits: a. South-western region,



80.1 to 114.4 berkovets (4.78 to 6.83 tons per acre); *b.* Central region, from 73.2 to 125.3 berkovets (4.37 to 7.48 tons per acre); *c.* Polish region, from 88 to 127.6 berkovets (5.23 to 7.61 tons per acre).

According to its quality, that is, the proportion of sugar in the sirup and the composition of the latter, the beet crop of 1890 differed but little from that of the preceding year, as appears from the following data for all the three regions.

| REGIONS.            | 1889—1890.      |                 | 1890—1891.      |                 |
|---------------------|-----------------|-----------------|-----------------|-----------------|
|                     | Sugar.          | Purity.         | Sugar.          | Purity.         |
| South-western . . . | 12.40 per cent. | 80.11 per cent. | 13.49 per cent. | 80.85 per cent. |
| Central . . . . .   | 12.34 " "       | 78.24 " "       | 13.63 " "       | 78.94 " "       |
| Polish . . . . .    | 14.94 " "       | 84.99 " "       | 14.81 " "       | 85.20 " "       |

Thus in both years Poland had the best beet, next following the South-western and Central regions. Moreover, in the preceding periods also, the same relation in reference to the quality of the beet existed between the said regions, that of the Polish region always standing first, followed by the South-western. The Central region ordinarily yielded by 5 to 6 per cent in the quality of the beet grown to the Polish region, and by 1 to 2 per cent, to the South-western governments. The only exception thereto was the beet of certain manufactories of the Kharkov and Kursk governments, which not only did not cede to that of Kiev, Podolian and Volynia but often even surpassed it.

The total yearly produce of the sugar manufactories at work in Russia in the beginning of the eighties attained 16 million pounds (257,920 tons), reckoning the actual yield of sugar from the beet. Russia thus occupied at that time in Europe the third place according to number of manufactories, and the fourth place in production. During the subsequent years the output of the Russian manufactories grew uninterruptedly till 1885—1886, when the production of sugar in the 241 manufactories then at work reached and even somewhat exceeded 29 million pounds (467,480 tons). From that time the production contracted to 26 million pounds (419,120 tons) and in 1887—1888, even to 23.7 million pounds (382,044 tons), the number of manufactories diminishing at the same time, first to 229 and then to 218. Afterwards, in the season 1888—1889, the dimensions of the output of the 220 manufactories then at work again increased, reaching 28,400,000 pounds (457,808 tons). In 1889—1890 there was however a fresh reduction in the production of sugar to 24,600,000 pounds (396,552 tons) in 220 manufactories, while in 1890—1891, as shown above, the 222 manufactories then working in European Russia produced even more sugar than in 1888—1889, namely, 28,475,000 pounds (459,017 tons). The results of the sugar-baking season, concluded in September 1892, shewed for 1891—1892 a total output upon 226 manufactories of 29,628,572 pounds (477,612.5 tons). This, taking into account the 26,255,612 berkovets or 4,232,404.6 tons of beet treated, corresponds to a yield of 45.08 pounds of sugar per berkovets, or 11.27 per cent.

Comparing the production of sugar for 1890—1891 directly with the number of manufactories in operation, it appears that to each manufactory there were 128,267 pounds (2,067.6 tons). As a matter of fact, however, the production of the manufactories was far from being so equally divided, proof of which is to be found in the following table, which gives the distribution of the manufactories according to the extent of their production in eight classes in each of the regions.

| GOVERNMENTS.      | EXTENT OF PRODUCTION OF SUGAR IN POUNDS. |                         |                         |                          |                           |                           |                           | Above<br>250<br>thous<br>and. |
|-------------------|--|-------------------------|-------------------------|--------------------------|---------------------------|---------------------------|---------------------------|-------------------------------|
|                   | Up to 25<br>thous-<br>and.               | 25—50<br>thous-<br>and. | 50—75<br>thous-<br>and. | 75—100<br>thous-<br>and. | 100—150<br>thous-<br>and. | 150—200<br>thous-<br>and. | 200—250<br>thous-<br>and. |                               |
| South-western . . | —  | 2                       | 8                       | 25                       | 44                        | 25                        | 9                         | 4                             |
| Central . . . . . | 2  | 11                      | 6                       | 10                       | 19                        | 11                        | 1                         | 5                             |
| Polish . . . . .  | —  | 2                       | 4                       | 7                        | 16                        | 5                         | 5                         | 1                             |
| Total . . . . .   | 2  | 15                      | 18                      | 42                       | 79                        | 41                        | 15                        | 10                            |

From this table it is evident that on the whole, as also in each separate region, the manufactories of the fifth class predominated, with a production of 100 to 150 thousand pounds (1,612 to 2,015 tons), forming 35.4 per cent of the total number of manufactories. The second and third places belonged to the manufactories of the fourth and sixth categories, with a production of 75 to 100 thousand pounds (1,209 to 1,612 tons), 18.8 per cent, and from 150 to 200 thousand pounds (2,015 to 3,224 tons) 18.4 per cent. The next places were occupied by the manufactories of the third, second, seventh, eighth, and first categories, the last being the least, namely in all, 2 manufactories or only 0.9 per cent of their total number.

In regard to the sort of sugar manufactured by the sugar bakeries and refineries, that is, refined sugar, white and brown moist sugar, the first place in respect to quantity belongs to white moist, the output of which forms about 84 to 85 per cent of the whole. Next follows refined sugar, of which 12 to 15 per cent is manufactured in the refineries partly immediately from the beet root and partly by refining the raw sugar already estimated in the form of white or brown moist sugar; brown moist sugar forms only 0.1 to 2 per cent of the total estimated sugar. Thus, during the seasons 1889—1890 and 1890—1891, out of the total estimated sugar in all the manufactories amounting respectively to 25,286,810 pounds (407,623.3 tons) and 29,319,287 pounds (472,526.9 tons), there were manufactured, white moist sugar 21,334,369 and 24,737,650 pounds (343,910 and 397,771 tons), that is, in both seasons 84.3 per cent; refined sugar, 3,922,031 and 4,360,223 pounds (63,223.1 and 70,286.8 tons), that is, 15.5 and 14.8 per cent; and brown moist sugar, 30,410 and 221,414 pounds (490.2 and 3,569.2 tons), that is, 0.2 and 0.9 per cent. At the same time, as part of the white and brown moist sugar, estimated for the payment of excise to the amount of 680,438 pounds (10,968.6 tons) in 1889—1890, and 843,857 pounds (13,602.9 tons) in 1890—1891, was converted into refined sugar in the refineries and in the form of

refined sugar was subjected to a second estimate, the total quantity of sugar subject to the actual payment of excise amounted in 1889—1890 to 24,606,372 pounds (396,654.7 tons), and in 1890—1891 to 28,475,430 pounds (459,024 tons). The purified sirup in the refineries also enters into the number of saccharine products upon which excise is paid. Of this there was produced in 1889—1890, 8,053 pounds (129.8 tons), and in 1890—1891, 8,989 pounds (143.9 tons). Besides the said quantities of saccharine products manufactured in the sugar bakeries and refineries, the refined sugar made in the single special syrup refining works in the government of Volynia also enters into the estimate and is offered for sale. This manufactory, which will be referred to again below, uses not beet but black treacle or molasses together with raw sugar, obtained from the beet sugar manufactories. The production of this kind of sugar in the manufactory in question was, in 1889—1890, 376,815 pounds (6,074.2 tons), and in 1890—1891, 341,911 pounds (5,511.6 tons), there being used in the first case 162,436 pounds (2,618.4 tons), and in the second 118,870 pounds (1,916.2 tons) of bought raw sugar.

The yield per cent of white sugar from beet, in the beginning of the eighties not exceeding 7 to 8 per cent and at the present time, thanks to the improved processes of the sugar industry and also to the superior methods employed in the cultivation of the beet itself and the stricter sorting of the latter on acceptance at the manufactories, is seldom less than 9 to 10 per cent, or 36 to 40 pounds per 10 pound berkovets, taking all the regions together where the beet sugar industry exists. Thus for the ten consecutive seasons from 1881—1882 to 1890—1891 the yield of white sugar from beet was expressed for the whole Empire by the following figures in percentages of the weight of beet root:

|                  |                |           |                |
|------------------|----------------|-----------|----------------|
| Season 1881—1882 | 7.43 per cent. | 1886—1887 | 9.13 per cent. |
| 1882—1883        | 7.67 » »       | 1887—1888 | 9.12 » »       |
| 1883—1884        | 8.60 » »       | 1888—1889 | 10.02 » »      |
| 1884—1885        | 8.58 » »       | 1889—1890 | 9.16 » »       |
| 1885—1886        | 8.58 » »       | 1890—1891 | 9.73 » »       |

Taking different regions, these yields were distributed far from equally. The largest yields were always in the manufactories of the Polish region, depending both upon the superior quality of the beet root and its stricter sorting on receipt at the manufactory and on the improved methods of manufacture, the more complete extraction of the sugar from the beet and the treacle, and in general more conscientious work. During the seasons indicated above these yields varied within the limits of 8.2 and 11.39 per cent, the yield in 1889—1890 forming 11.39 per cent, and in 1890—1891, 11.28 per cent. Corresponding to the high yields of white sugar in the manufactories of the Polish region were the low yields of black treacle or molasses, varying between 1.53 and 2.28 per cent, these yields during the last two seasons not exceeding 2.12 per cent by weight of the beet employed. Next to the manufactories of the Polish region, in regard to the yields of white sugar, followed those of the South-western region, in which the said yields fluctuated between the limits of 7.7 per cent and 10.48 per cent, the latter being in 1888—1889, while in 1889 to 1890 the yield was 8.91 per cent and in 1890 to 1891, 9.46 per cent. Finally in the central region the least yield was obtained in 1882—1883, 7 per cent, the

highest in 1890—1891, 9.47 per cent, while in the preceding season of 1889—1890, it was 8.68 per cent.

As for the yields of black treacle, they varied in the manufactories of the South-western region between 3.60 and 4.31 per cent, and in those of the Central region between 3.29 and 4.24 per cent. The cost of the manufacture per pound of sugar, being dependent upon the economical and technical conditions of the industry, the cost and qualities of the beet, the methods of production, the cost of materials, the amount of piece-wages, the expenses of management et cetera, is extremely variable in different manufactories and fluctuates within considerable limits. In general this cost, in proportion to the development and improvement of the industry, the diminution of the various general expenses, principally in the maintenance of the administration of the manufactory and of the workmen, the reduced expenditure of fuel, the improved culture of the beet, its stricter sorting, the application of more perfect ways of producing sugar et cetera, decreased gradually and in the period of 1889 to 1890 this cost was, for the greater part of the localities where beet sugar is produced, 2.22 to 3 roubles, not including the excise, and in the period 1884 to 1885 and 1885 to 1886 it amounted to 3.60 roubles, without excise. From 1890 to 1891 the cost of producing sugar decreased per pound, in the government of Kiev to 37 kopecks, of Volyn to 9 kopecks, and of Podolsk from 5 to 10 kopecks.

Turning to the technical side of the beet sugar industry, that is, to the methods and processes of extraction at the works, it is necessary to point out the means now in vogue for separating the juice from the solids, for purifying the juice, its evaporation and concentration and for treating the residues and molasses.

Until the close of the seventies the Russian beet sugar works chiefly extracted the juice by pressing the ground pulp of the roots in hydraulic and almost exclusively steam presses. Out of the 245 works, in action during the period 1877 to 1878, 156 works with 424 hydraulic presses, employed this process, while 81 out of the remaining 89, worked by diffusion, and the remaining 8 employed other more or less antiquated methods, such as screw presses, hot and cold soaking of the pulp, centrifugal machines and one factory employed Lebé's continuous acting rolling presses. Subsequently the diffusion process became more and more general, being considerably cheaper and giving a greater proportion of sugar from the beet. At the present time factories employing presses form a rare exception and those will doubtless also very shortly take to the diffusion process. Thus during the periods 1889—1890 and 1890—1891, only seven of the 220 and 222 sugar works in European Russia employed presses, of which there were 18 with 33 cylinders for soaking the pressed pulp. On the other hand during the period 1889—1890, 213 works with 2,721 diffusion vats employed the diffusion process, while in 1890—1891 there were 215 works with 2,792 diffusion vats of varying capacity, forming on the average 136.6 vedros (444 gallons) per diffusion vat during 1889—1890, and 138.4 vedros (449.8 gallons) during 1890—1891.

As regards the quantity of roots treated at the diffusion and press works, the former during 1889—1890 turned over 26,255,142 berkovets (4,232,329 tons) or 123,263.6 berkovets (19,870 tons) per factory; and during 1890—1891, 29,773,368 berkovets (4,799,467 tons) or 138,480.7 berkovets (22,323 tons) per factory. On the

other hand, the amount of roots treated at works employing presses in 1889—1890 was 448,084 berkovets (72,231.1 tons), that is, on the average 64,012 berkovets (10,318.7 tons) per factory; and during 1890—1891, 424,805 berkovets (68,478.5 tons) or 60,686 berkovets (9,782.6 tons) per factory. The purification of the juice attained by diffusion or pressure from the pulp or parings previous to being subjected to straining or saturation is now most usually by filtration alone in mechanical apparatus of various kinds. In some works the juice is purified chemically by means of sulphurous acid, instead of the usual means of saturation with carbonic acid. A mechanical filtration of the juice, purified by saturation, has also become more and more frequent, in as much as it makes a great saving in bone-black, which in many works is not used for passing the defacate juice, but only for purifying the sirups.

The chief improvement made in the process of evaporating the juice in boilers with exhausted air, consisted in enlarging the heating surface of the apparatus by transforming them from simple double acting, into triple, quadruple and quintuple acting apparatus with a view of saving fuel.

During 1889—1890, there were altogether 352 evaporating apparatus at the 220 works in action, with 1,241 chambers having a total heating surface of 1,327,246 square feet; while during 1890—1891 the number of apparatus at the 222 works decreased to 345 with 1,240 chambers but the total heating surface had increased to 1,351,427 square feet.

As regards the boiling down of the sirup and residues the most recent improvements consisted in replacing the old concentrating apparatus with those of larger capacity and heating surface, with an arrangement for boiling the sugar residues with the steam from the evaporating apparatus.

With a view to hastening the treatment and decoloration of the residues the former centrifugal cylinders were replaced by new ones of larger dimensions with a greater capacity and various arrangements for diminishing the loss of sugar, for instance, by raking it through the bottom of the centrifugal cylinder and carrying it automatically to the drying ovens.

The steam power used at the sugar works has gradually increased with the installation of new boilers and engines. The total power of the works during 1889—1890 was given by 1,997 boilers of various systems, having a total of 112,715 horse power, and 2,570 engines of 33,520 horse power, while during 1890 to 1891, the number of boilers increased to 2,029 and their capacity to 127,221 horse power; the number of steam engines during the same period was 2,624 of 34,725 horse power.

Another important, if not so essential, improvement was the introduction of electric lighting in the works, thirty-eight of which were so lighted during 1889—1890 and forty-four, during 1890—1891.

The sugar works employ fuel of all kinds, namely, wood, coal, lignite, naphtha refuse and peat. Wood however is the predominating fuel and is used by most of the Russian works. As regards the extent of the consumption of wood fuel, it is far from uniform and varies between the wide limits of 10 and 20 cubic sages per 1,000 berkovets of beet treated. Next to wood, coal is the chief fuel and forms the principal combustible material of the Polish works. The remaining kinds of fuel,

lignite, naphtha refuse, and peat, are of only secondary importance and are only consumed in extremely limited amounts.

During the year 1889-1890 thirty-seven out of the sixty-one works in the government of Kiev used wood only, seventeen, a mixture of wood and coals, and seven, coals only, consuming altogether 86,045 cubic sagenes of wood, 2,837,804 pounds of coal and 583,398 pounds of lignite. After translating the two latter classes of fuel into their corresponding equivalents of wood (one cubic sagne of wood equals 120 pounds of Donets, 135 of Dombrovsk and 140 to 200 pounds of various other kinds of coal, and 460 to 500 pounds of lignite) it is seen that the total amount of fuel consumed corresponded to 109,655 cubic sagenes of wood, and as 7,457,822 berkovets of beet were treated, the consumption per 1,000 berkovets was on the average 14.7 cubic sagenes. During 1889-1890 naphtha fuel was employed at very few works, among which two sugar factories in the government of Samara consumed 1.57 and 1.34 pounds per pound of raw sugar produced. As the question of fuel is one of vital importance to the sugar industry, the search for means and methods of diminishing its consumption forms an object of continual care on the part of the owners of sugar works, and requires special attention to the economical construction of the boiler furnaces and to the improvement of the processes of boiling down and concentrating the juice.

One of the most important by-products of the beet sugar manufacture is molasses, which was formerly a positive burden to the sugar works subsequently it was used for fertilizing the soil, compost pits and partially as food for cattle. At the present time this product, which contains about fifty per cent of crystalline sugar, is used in considerable quantities in the manufacture of spirits. There are also various processes such as osmosis, elutriation and separation by strontium, by which the sugar contained in the molasses can be extracted. All these processes have been successfully applied in Russia at the beet sugar works themselves, or else, as in the case of the strontium process, at special works. During 1889-1890, the sugar was extracted from molasses by means of osmosis at eight works, with 102 osmotic apparatus, in the Central and South-western districts, and at twenty-four works with 193 apparatus in Poland.

During 1890-1891 the molasses was treated by this method at ten works having 125 osmotic apparatus in the central and South-western districts, and at twenty-four works having 206 apparatus in Poland.

Manury's elutriation process is adopted at three works: the Balakleevsk and Naboutovsk works in the government of Kiev and at the Uzefovsk works in the government of Warsaw. The first mentioned works treat daily up to seven hundred pounds of molasses of density from 38° to 41° Baumé, and containing about 50 per cent of sugar, the second works treat up to a thousand pounds containing 49.2 per cent of sugar, and the third, about 850 pounds containing about 58 per cent of sugar. The loss of spirit in treating the molasses by Manury's process does not exceed 0.6° per pound of molasses, and generally it is less. During 1889-1890 the total amount of molasses treated by this process at the above three works was 182,290 pounds (2,938.5 tons); and in 1890-1891, 248,438 pounds (4,004.8 tons) were treated.

Stephen's separation method was adopted by six works during 1888-1890 and 1890-1891. During 1889-1890, 520,676 pounds (8,393.3 tons) of molasses containing from

43 to 54.6 per cent of sugar of a purity of 58.8 to 68.6 per cent were treated. During 1890-1891, 559,441 pounds (9,018.2 tons) containing from 42.53 to 50.68 per cent of sugar of a purity from 59.06 to 64.5 per cent were treated.

In Russia the extraction of sugar from molasses by means of strontium is only carried on at the Zhitinsk molasses-refining works in the government of Volinsk. During 1889-1890 these works treated 494,672 pounds (7,974.1 tons) of black molasses containing 50.7 per cent of sugar of a purity of 64.67 per cent together with 162,146 pounds (2,618.5 tons) of raw sugar bought from other works. The yield of sugar from the molasses alone was estimated at 42.2 per cent. During 1890-1891, the same works treated 118,870 pounds (1,916.2 tons) of raw sugar and 501,178 pounds (8,079 tons) of molasses containing 50.73 per cent of sugar of a purity of 64.37 per cent and the approximate yield for the molasses alone was 43.6 per cent.

It will be seen from the above, that the extraction of sugar from molasses is making slow but sure progress in Russia. Thus during 1889-1890 there were forty-two works carrying on this industry, and in 1890-1891 this number had increased to forty-four.

The sugar industry occupies from eighty-six thousand to eighty-seven thousand persons, men, women and children. Thus, during the period 1890-1891, the total number of labourers occupied in the 223 works then in action, amounted to 86,681, distributed amongst the different sugar-producing regions in the following manner.

| GOVERNMENTS.              | No of works. | NUMBER OF LABOURERS. |        |           |        | Average number per works. |
|---------------------------|--------------|----------------------|--------|-----------|--------|---------------------------|
|                           |              | Men.                 | Women. | Children. | Total. |                           |
| South-western . . . . .   | 117          | 40,483               | 4,055  | 287       | 44,825 | 383                       |
| Central . . . . .         | 65           | 21,604               | 2,781  | 218       | 24,603 | 378                       |
| Poland . . . . .          | 40           | 14,203               | 2,946  | 26        | 17,175 | 428                       |
| Eastern Siberia . . . . . | 1            | 40                   | 30     | 8         | 78     | 78                        |
| Total . . . . .           | 223          | 76,330               | 9,812  | 539       | 86,681 | 388                       |

These data show that 86.06 per cent of the total number of persons employed in the sugar industry are men; then come women, 11.32 per cent, and then children, that is, labourers under fifteen years of age, 0.62 per cent. The percentage relation between these three classes of labour, in the three regions of European Russia is as follows.

| GOVERNMENTS.            | M e n.          | W o m e n.    | Children.      |
|-------------------------|-----------------|---------------|----------------|
| South-western . . . . . | 90.31 per cent. | 9.05 per cent | 0.64 per cent. |
| Central . . . . .       | 87.81 " "       | 11.31 " "     | 0.88 " "       |
| Poland . . . . .        | 82.69 " "       | 17.15 " "     | 0.16 " "       |

Thus, man labour greatly predominated in all the regions; the percentage of woman labour was highest in those regions where the number of factories was the least, and that of child labour, in the central region of Russia.

The monthly wages of the labourers employed in the sugar industry may be indicated as follows.

| GOVERNMENTS.              | M e n.     | W o m e n. | Children. |
|---------------------------|------------|------------|-----------|
| South-western . . . . .   | 5 to 10.50 | 3 to 8.00  |           |
| Central . . . . .         | 5 . 16.00  | 3 . 10.50  | 4.50 to 9 |
| Eastern Siberia . . . . . | — . 13.00  | 10 . 40.00 | 5.20 —    |

These data prove that the wages were highest in the governments of central Russia and in eastern Siberia, and lowest in the south-western governments. Satisfactory data for the rate of wages in Poland are wanting.

During 1889—1890 and 1890—1891, there were seventeen special sugar refineries exclusively treating the raw sugar made at other works. The distribution of these refineries over the Empire and the extent of their yield was as follows.

| GOVERNMENTS.             | 1889—1890.               |                 | 1890—1891.               |                 |
|--------------------------|--------------------------|-----------------|--------------------------|-----------------|
|                          | N <sup>o</sup> of works. | Yield in pouds. | N <sup>o</sup> of works. | Yield in pouds. |
| Kiev . . . . .           | 4                        | 3,400,348       | 4                        | 3,591,112       |
| Moscow . . . . .         | 4                        | 2,291,674       | 4                        | 2,424,129       |
| Kherson . . . . .        | 1                        | 2,282,008       | 1                        | 2,039,893       |
| Kharkov . . . . .        | 2                        | 1,869,691       | 2                        | 1,601,381       |
| Chernigov . . . . .      | 2                        | 1,419,481       | 2                        | 1,520,417       |
| St. Petersburg . . . . . | 2                        | 1,166,652       | 2                        | 1,165,946       |
| Tula . . . . .           | 1                        | 884,314         | 1                        | 862,683         |
| Podolia . . . . .        | 1                        | 698,397         | 1                        | 699,096         |
| Total . . . . .          | 17                       | 14,012,560      | 17                       | 13,904,657      |

Altogether, counting the refined sugar produced at the thirty-five sugar refining works treating their own and other raw sugar, and also the Zhitinsk molasses refinery to the amount of 4,298,846 pouds (69,297.5 tons) during 1889—1890 4,702,134 pouds (75,798.5 tons) during 1890—1891 and the total yield of refined sugar in Russia amounted to 18,311,406 pouds (295,179.9 tons) during 1889—1890 and 18,606,791 pouds (299,941.6 tons) during 1890—1891.



Taking the moderate price of four roubles per pound for raw, and five roubles per pound for refined sugar, it is found that during 1890—1891 the Russian sugar industry, for these two chief products only, realized a sum of about 189,494,000 roubles, and namely, the yield of the raw sugar works, 24,115,127 pounds (388,736 tons) having a value of 96,460,000 roubles and the sugar refineries, 18,606,800 pounds (299,941.6 tons) having a value of 93,034,000 roubles.

The following table gives an idea of the fluctuations in the price of raw sugar on the Kiev market during the last five years.

| Y E A R S.          | Minimum price. | Maximum price. |
|---------------------|----------------|----------------|
|                     | R o u b l e s. |                |
| 1884—1885 . . . . . | 3.80           | 5.15           |
| 1885—1886 . . . . . | 3.05           | 5.00           |
| 1886—1887 . . . . . | 2.99           | 3.97           |
| 1887—1888 . . . . . | 4.22           | 4.50           |
| 1888—1889 . . . . . | 3.90           | 5.00           |
| 1889—1890 . . . . . | 4.15           | 4.60           |
| 1890—1891 . . . . . | 4.00           | 4.50           |

In 1891 the price varied between 3.85 and 4.90 roubles per pound. The lowest price for refined sugar was 5.30 and the highest 5.50 roubles per pound.

The following table, showing the amount of sugar bought by the trade from the works, gives an idea of the consumption of sugar in Russia.

| Y E A R S.          | A M O U N T O F S U G A R. |           |
|---------------------|----------------------------|-----------|
|                     | Pounds                     | Tons.     |
| 1887—1888 . . . . . | 21,324,065                 | 343,744.0 |
| 1888—1889 . . . . . | 22,145,587                 | 356,986.9 |
| 1889—1890 . . . . . | 22,790,772                 | 367,387.1 |
| 1890—1891 . . . . . | 23,265,996                 | 375,067.9 |

According to these figures, and taking the population of Russia during these years at 115 to 118 millions, the consumption of sugar per capita would be from 7.4 to 7.9 pounds.

The exportation of raw and refined sugar from Russia during the last seven years is indicated below.

| YEARS.        | Raw sugar.   | Refined su-<br>gar. | TOTAL.    | IN THOUSAND OF TONS. |                   |        |
|---------------|--------------|---------------------|-----------|----------------------|-------------------|--------|
|               | P o u n d s. |                     |           | Raw su-<br>gar.      | Refined<br>sugar. | Total. |
| 1885. . . . . | 4,069,914    | 163,615             | 4,253,529 | 66                   | 3                 | 69     |
| 1886. . . . . | 3,362,656    | 445,035             | 3,807,691 | 54                   | 7                 | 61     |
| 1887. . . . . | 3,812,312    | 770,521             | 4,582,833 | 61                   | 12                | 74     |
| 1888. . . . . | 4,524,161    | 1,056,658           | 5,580,819 | 73                   | 17                | 90     |
| 1889. . . . . | 3,324,219    | 1,146,983           | 4,471,202 | 54                   | 19                | 73     |
| 1890. . . . . | 2,357,185    | 915,563             | 3,272,748 | 38                   | 15                | 53     |
| 1891. . . . . | 6,317,074    | 1,251,813           | 7,568,887 | 102                  | 20                | 122    |

The export of sugar is most considerable across the European frontier, and is usually three or four times greater than that across the Asiatic. However, in 1890 an almost equal quantity was exported over both frontiers.

The importation of sugar, raw, refined and Chinese candy into Russia during the same years was very small and amounted to:

|               |        |        |    |        |       |
|---------------|--------|--------|----|--------|-------|
| 1885. . . . . | 7,076  | pounds | or | 114.06 | tons. |
| 1886. . . . . | 4,825  | »      | »  | 77.80  | »     |
| 1887. . . . . | 5,275  | »      | »  | 85.03  | »     |
| 1888. . . . . | 3,871  | »      | »  | 62.40  | »     |
| 1889. . . . . | 4,558  | »      | »  | 73.50  | »     |
| 1890. . . . . | 37,393 | »      | »  | 602.78 | »     |
| 1891. . . . . | 8,560  | »      | »  | 137.99 | »     |

In conclusion, the following table gives the Government revenue from 1882 to 1891, levied upon the internal production in the form of excise, license and other taxes on the sugar industry.

| YEARS.         | Excise.        | License and<br>other taxes. | TOTAL.     |
|----------------|----------------|-----------------------------|------------|
|                | R o u b l e s. |                             |            |
| 1882 . . . . . | 7,962,258      | 92,789                      | 8,055,047  |
| 1883 . . . . . | 8,783,178      | 95,046                      | 8,878,223  |
| 1884 . . . . . | 12,252,953     | 142,811                     | 12,395,764 |
| 1885 . . . . . | 13,676,172     | 186,420                     | 13,862,592 |
| 1886 . . . . . | 14,62,877      | 996,303                     | 15,859,180 |
| 1887 . . . . . | 22,836,437     | 2,573,706                   | 25,410,143 |
| 1888 . . . . . | 16,892,511     | 2,554,204                   | 19,446,715 |
| 1889 . . . . . | 17,781,419     | 1,564,317                   | 19,345,736 |
| 1890 . . . . . | 21,463,390     | 165,915                     | 21,629,305 |
| 1891 . . . . . | 20,660,091     | 197,351                     | 20,857,442 |

On September 1, 1892, as has already been mentioned, the excise upon raw sugar was supplemented by an excise of 40 kopecks per poud upon refined sugar, and as the total production of refined sugar is not less than eighteen million pouds per year, therefore this supplementary excise should bring in about 7,200,000 roubles. Besides this the sugar refineries and works pay a special license of five roubles per thousand pouds of refined sugar produced. With the above yearly production this tax will bring to the Government about 90,000 roubles additional income.



## CHAPTER XVIII.

## The distillation of spirits\*.

**T**HE manufacture of spirits, as dealing with the products of agriculture on the one hand, and as furnishing the farming industry with an excellent food for cattle in the form of malt, on the other hand, occupies for these reasons a predominating position among the agricultural manufactures. In Russia, mainly a farming country, this relation is particularly apparent. But beyond the importance which the manufacture of spirits has to Russia, for these reasons it also plays a salient part to the State as furnishing, in the form of excise dues, about one-third of the Government revenue.

HISTORICAL REVIEW OF THE GOVERNMENT MEASURES RESPECTING  
THE ALCOHOLIC INDUSTRIES.

The use of corn spirit, called *vodka*, became known in Russia very soon after its appearance in Western Europe. In the sixteenth century there were already drinking houses in the towns, and in the seventeenth century the sale of wine, beer, and mead, and the distillation of alcohol for the purposes of sale, formed the exclusive right of the State, who either acted through their own agents, or else leased their right to private individuals. The spirit was either prepared at State distilleries, or at private works commissioned by the State, and was then sold in public houses kept on trust or leased. In the first case the sale was carried on by a person entrusted by the State, but not personally interested in the business, but in the second case the business was conducted by the farmer, who endeavoured by every means to increase the sale thereof, thereby greatly encouraging drunkenness. The distillation was at that time conducted in the most primitive manner. The works were exclusively oven distilleries, and the spirit was prepared exclusively from rye. Landowners were only allowed to

\* For viticulture and wine making see Volume III, Agriculture and Forestry.

distill spirit for their personal use. The tavern keepers and lessees manufactured the State spirits in distilling and tavern yards, which had quite the appearance of small towns, surrounded on all sides by walls or wooden palings, with the necessary distillery and house buildings. There were similar establishments in all the towns and large villages, and the spirits were supplied from them to the markets and fairs, where temporary taverns were set up.

This system of the manufacture and sale of spirits by the State, or in other works, the alcoholic regalia, continued in force during the commencement of the reign of Peter the Great. In 1705, however, the spirit dues were rented out, and the former regime of these dues gradually modified, and at the close of the eighteenth century, totally abolished. At the same time, with a view to increasing the State revenue, the distillation itself was, already in the reign of Peter I. subjected to a moderate tax, which was levied to the amount of twenty-five kopecks upon each vedro of capacity of the stills. The extent of the spirit manufacture at the middle of the eighteenth century can be judged from the fact that the yearly capacity of all the distilleries was only 3,962,471 vedros. In 1781 the manufacture of spirit by the lessees was abolished and became the sole right of the State, who carried on the distillation at their own distilleries or by contract, the lessees being given only the right of sale at a price nominated by the State. The price varied between two and four roubles per vedro.

The stamping of the stills according to their capacity, and the tax imposed, were abolished at the same time. Then in 1795 the State again ceded some of its rights over the manufacture of spirits to lessees, who obtained permission to buy spirits direct from the distillers without the medium of the Government, being thereby placed under more favourable conditions. The price of spirits was raised to seven roubles per vedro, and the lessees holding the monopoly of the trade became rich, powerful and important personages. However, the alcohol trade was sorely oppressed by them, and the Government dues were so irregularly paid that in 1811 the arrears of the lessees had accumulated to thirty-seven million roubles. Hence in 1819 the State direction of the spirit trade was reinstated in the governments of Great Russia. The spirits were prepared by the Government at its own distilleries, or under contract at private works, who were once more obliged to deal solely with the State. The control over these distilleries was, however, limited to revisions by Government officials of the account books kept by the distillers. The distillation of spirits for home use was forbidden. The sale of spirit to private individuals was conducted by Government stores of which there was one in every town dealing in vedros. Besides this, in every town there were several drinking houses where spirits were retailed at a regular price per glass. The wholesale price was fixed at seven roubles per vedro, and an excise of six roubles per vedro was levied upon corn spirits.

The State direction did not, however, remain long in force. Immediately after its establishment the consumption of wine began to decrease rapidly, and in order to keep the spirit revenue from decreasing it was found necessary to raise the price of spirits to eight roubles per vedro. But this measure, combined with the increasing dishonesty of the salesmen, diminished the sale still more, and the excisable quantity fell from 18,545,531 vedros in 1819, to 11,956,797 vedros in 1825, and 12,088,318 vedros in 1826. Hence in 1826 the renting system was again adopted under almost the same

conditions as before. According to these conditions a certain proportion of spirits was manufactured by the State, and sold to the lessees at a fixed price approximating actual cost, while the spirits in excess of this proportion were acquired by the lessees independently of the State, as they might find most advantageous to themselves. The fixed selling price varied, according to the quality of the spirit, between eight and sixteen roubles paper per vedro. But subsequently, after converting the account into silver roubles, the price was determined at 3 to 6 roubles per vedro. The excise upon the spirit and all the other dues upon its sale were handed over to be collected by the lessee for his own use.

In order to prevent an illicit trade, the manufacture was subjected to a strict supervision and control on the part of the lessees, who were allowed to have their overseers at the distilleries for this purpose. Being endowed with such authority, they had the power of encouraging the spirit trade in one locality and of completely killing it in another, and at the same time of bringing a great pressure to bear, not only on the population of the locality leased by them, but also on the Governemental administration of that province, by which the interests of both the population and State suffered. For this reason the leasing system was in 1847 exchanged for the so-called excise-leasing commission system, which consisted in the following features: the collection of the excise dues was as before leased in separate districts or towns, with the difference that the lessee, who took upon himself the collection of these dues, became at the same time the commissioner for the sale of the spirit. Notwithstanding the seeming difference between this and the previous leasing system, there was really scarcely any essential difference between the two in practice. The spirit trade as before remained entirely in the hands of the lessees, who based their calculations mainly on the advantages accruing from the sale of the liquor itself, and the revenue from the collection of the excise dues was only a secondary consideration, and in some instances was exceedingly small. In the meanwhile the manufacture of spirits was completely separated from the agricultural interests, and carried on without the slightest regard to the latter. It most frequently bore an incidental character; in certain localities, where the manufacture of spirits might have been a support to agriculture, it was completely neglected, while it was encouraged in districts where a combination of favourable conditions of soil or industry excluded the necessity of such an auxiliary industry.

Such an abnormal condition of affairs could but attract the attention of the Government, which, almost immediately after the introduction of the excise-leasing commission system, began to seek for a more convenient mode of extracting the revenue upon spirits. But endeavours of this nature, in view of the then existing economic condition of the country, could not be realized, and the leasing method continued in force until January 1, 1863, when a radical reform was at last made in the mode of collecting the liquor dues, and the now existing excise system of collecting the revenues upon spirituous liquors was adopted.

As has been already mentioned, the leasing system, and also the excise-leasing commission system, were only in force in the governments of Great Russia. In the other portions of the Empire the legislative measures respecting the manufacture and the collection of liquor dues retained as far as possible the order in vogue before the union of these districts to Russia. Thus, in the governments in the district

of Novorossisk, Little Russia, the Crimea, and the north-western provinces, and in the towns and villages belonging to the State, the sale of spirits was at first conducted in State taverns, and afterwards the liquor trade was leased, the leases being termed *charochni*, signifying a little cup. At the same time the consumption of spirits was subjected to a special tax upon the manufacture of spirits, which, although fixed at from 70 kopecks to one rouble per vedro, in reality formed an assessed tax levied upon the population, fixing the consumption at one vedro per head per year. Notwithstanding the imperfect uniformity of the distribution of this tax, it gave a great freedom to the manufacture, owing to which the so-called privileged governments, formed from the above-mentioned districts, produced a great number of small distilleries belonging to separate landowners and greatly helping the income derived from their estates. Subsequently the above tax was replaced by an excise levied to the amount of 1.20 roubles per vedro of spirit manufactured for local consumption, and instead of the excise upon the drinking houses, in places enjoying free sale of spirit, a liquor tax was fixed considerably higher than the price of the former licenses.

In the Baltic provinces the liquor revenue was levied in the form of a distillery tax, at first of 60 kopecks, and subsequently of one to two roubles paper per vedro on the assumed consumption of one vedro per head per year, and also of a license tax upon drinking houses. In the towns a special liquor tax was levied, whose extent was determined by the Government for each town separately. In Poland the manufacture of spirits bore an entirely agricultural character, and until 1844 the production was not subject to any taxation. In 1844 an excise was placed upon the distillation of spirits, which until 1862 varied in proportion to the yield of the distilleries. But in 1862 it was changed, and a uniform excise of 34 kopecks per vedro was put upon spirits of 78° Tralles strength; this was subsequently raised to one rouble. Besides this excise, the towns in Poland paid a consumption tax determined upon the number of inhabitants in the towns which were divided into five classes according to the dimensions of the tax. Independently of these two forms of liquor taxation, there was another special tax for the propination licences for all persons participating in the manufacture and traffic of spirits.

And lastly in the other portions of the Empire, namely in Siberia, the Caucasus, and the province of the Don Cossacks, the modes of collecting the liquor revenues were more or less similar to those practised in Great Russia; only in the Don province the revenue did not go to the State but to the use of the Don Cossacks.

During the last years of the existence of the leasing system, that is, previous to the introduction of the excise system, the liquor trade of the Empire, not including Poland, was in the following position. In 1860 the governments of Great Russia included 723 distilleries, whose total possible yield was 113 million vedros of under-proof spirits, that is, of 38 per cent. Tralles, which on the average formed over 155,000 vedros per distillery. In reality far from all the distilleries were in work, so that their actual yield did not exceed 19 million vedros, or one-sixth of the full capacity.

The following figures show the number of distilleries of different possible capacities.

|                                    |     |              |
|------------------------------------|-----|--------------|
| Under 10,000 vedros . . . . .      | 35  | distilleries |
| From 10,000 to 100,000 vedros. . . | 371 | »            |
| » 100,000 to 500,000 » . . .       | 259 | »            |
| Over 500,000 vedros. . . . .       | 58  | »            |

Hence, large distilleries having an average capacity of 100,000 vedros were in the majority. In the privileged governments there were, in all, 4,437 distilleries, but many of them were also inactive. Distilleries having a yearly capacity from 2,000 to 10,000 vedros of underproof spirit predominated. The average yield was about 7,700 vedros per year.

The distilleries both of Great Russia and of the privileged governments were of the simplest construction. The crushing of the spirit-yielding material was conducted by means of hand beaters, or simple wooden stirrers moved by horse gins, and the distillation was in wooden stills requiring a large amount of steam. In the privileged governments the distillation was carried on by the landowners, chiefly as a means of using up waste products. In Siberia there were only three State distilleries, with a normal capacity of 1,800,000 vedros. In all the Baltic governments also small distilleries, with an average yearly yield of 6,000 vedros, predominated, but the actual number of distilleries formerly in action is not exactly known. As regards Poland, in 1860 there were as many as 1,897 distilleries with a yearly capacity of 7,800,000 vedros of underproof spirits.

From approximate data on the yield of the distilleries of the Russian Empire during the last years of the leasing system, it may be estimated that shortly before the introduction of the excise system the production of spirit was as follows:

|  |                                    |
|--|------------------------------------|
|  | Vedros of under-<br>proof spirits. |
| European Russia (not including the Baltic provinces) and Siberia . . . . . | 52,000,000                         |
| Baltic governments . . . . .   | 3,000,000                          |
| Poland . . . . .   | 7,800,000                          |
| Total . . . . .  | 62,800,000                         |

The above figures correspond to 23,864,000 vedros of anhydrous spirits, for the preparation of which about 8,350,000 chetverts of rye were required, counting that in the Russian governments and Siberia one chetvert yields seven and a half vedros, and in the Baltic governments and Poland, eight vedros of underproof spirits.

The introduction of the excise system in 1863 gave great freedom to the spirit industry in Russia, because its manufacture became a free enterprise, and the traffic in spirits an object of free trade. A tax was instituted in the form of an excise upon the production, and of license dues upon the distilleries and places of sale. The dues upon distilled spirit was first fixed at 4 kopecks per degree, equalling one-hundredth part of the vedro, and in its computation the normal yield of spirit from all the materials used in practice at the different works was determined. Thus, the yield of the various foodstuffs, including millet, buckwheat and peas, was fixed at 24 to 36 degrees, of potatoes from 8 to 8.5, and of beet at 6.5 to 7 degrees per pound. Moreover, the Government wishing to guarantee a more or less definite revenue, and to incite the distillers to perfect the technical side of the industry, gave them the right



to the free use of whatever amount of spirit they obtained over the normal, the so-called *superdistillate*, which considerably aided the perfection of the industry in the sense of giving better returns. On the other hand the distiller who, from want of care or knowledge, obtained a yield below the normal, a *subdistillate*, was obliged to pay excise for the entire normal yield. As the yield of spirit is also determined by the quality of the material, therefore two normals were fixed, a higher and a lower, the choice of which was left to the distiller, with this difference that if he chose the higher normal, he obtained the right over all the superdistillate, while if he chose the lower he had to pay excise upon half the subdistillate.

Under such favourable conditions it might have been expected that the number of distilleries would have increased, but as each one had to be under the supervision of the excise office, the new system, in order to facilitate the control, limited the extent of the production by fixing the lowest yearly production at 2,250 vedros of underproof spirits, and forbidding distilleries with a smaller yield. The distilleries were under the constant supervision of an excise officer who controlled the materials for the mashes, so as to guarantee as far as possible the amount of the excise due to the State. In order to prevent the mashing of the superfluous materials, the capacity of the fermentation vats was accurately measured, and it was presumed that each pound of mashed foodstuffs corresponded to nine vedros of capacity of the fermenting vat; each pound of potatoes, to three and a half vedros; and each pound of beet to two and a half vedros; while the minimum capacity of all fermenting vats was fixed at 540 vedros.

The result of these measures was the closing of the smaller distilleries, on the one hand, and the development of the larger and perfected distilleries, on the other. It was found that, during the first year of the introduction of these measures, only 4,386 distilleries out of the previously existing 4,624 satisfied the new requirements, and out of these only 4,019 were really in action. The reduction chiefly took place in the formerly privileged governments; in the Baltic governments the number of distilleries changed but little, while in the Great Russia governments a number of new distilleries were built, which however were soon closed, only leaving the larger and well-constructed ones in action.

Experience soon proved that the fixed normals of the yield of spirit were far from being the limiting amounts, and that it was possible with a certain knowledge to obtain large superdistillates from all the materials. It was found that the manufacture of spirit from potatoes, for which a very low normal had been taken, was particularly profitable in this respect, and hence the production of potato spirits more than doubled in the space of two years. In the Baltic governments, the amount of superdistillate obtained, reached 20.9 per cent, while the quantity of cereals distilled hardly varied. In some instances, as in Esthonia, the percentage of superdistillate attained the large figure of 33 per cent; in other places, on the contrary, an underdistillate was obtained. Hence the amount of the excise obtained from the actual production began to vary within very wide limits, and the difference in the cost of the manufacture in different works often amounted to 75 per cent. At the same time it was found that, owing to the cheapness of grain, labour and fuel, the manufacture of spirits was really very inexpensive. Thanks to these conditions the production of spirits began to increase rapidly, but owing to the want of good means of commu-

nication it could not be brought quickly to the places of consumption, but accumulated at the distilleries, and caused a considerable fall in the price.

It was found that, under the new system, the price of the spirit was not determined by the yield or actual cost of production, but by the amount of superdistillate obtained. Hence, all the efforts of the distiller were directed to increasing the production, in order to obtain a larger amount of superdistillate without taking into consideration the other elements of the industry. In many places the malt was not of the least consideration but was thrown away, into rivers or elsewhere. The spirit manufacture began to isolate itself from the agricultural interests, and to pass into an independent industry. The larger distilleries were set up with every technical improvement, which enabled them to obtain a considerable superdistillate; and the distillers, following up this narrow aim, more often gravitated towards the towns, which presented greater advantages than the villages. Under these circumstances the manufacture began to acquire a commercial character, and to concentrate itself in the hands of capitalists. This fact, combined with the improvements made every year in the modes of manufacture, the installation of perfected apparatus for distillation, and the improved processes for treating the spirit-yielding materials, induced the Government to undertake a whole series of measures with the object, on the one hand, of gradually diminishing the superdistillate and increasing the normals, and on the other hand, of diminishing the measure of capacity of the fermentation vats per pound of spirit-making stuffs, and also of changing the system of fermentation, that is, of diminishing the number of days employed by the distillers for the process of treating the mash from which the spirit is distilled. The first alteration made in the normals took place in 1864, when they were raised from 3 to 4 per cent for grain stuffs, and from 12 to 30 per cent for potatoes; then, in 1866 a third and higher normal was added to the former two. This normal was determined at 37° for dried cereals, at 24.66° for green malt, 11.66° for potatoes, and 7.5° for beet; but in 1876 these normals were again raised to the following figures:

|                        | Lower.     | Medium.     | Higher.     |
|------------------------|------------|-------------|-------------|
| For grain stuffs . . . | 33° to 35° | 35° to 37°  | 37° to 38°  |
| > green malt . . .     | 22° > 23½° | 23⅓° > 24⅓° | 24⅓° > 26⅓° |
| > potatoes . . .       | 9° > 9°    | 10½° > 11°  | 11⅓° > 12°  |
| > beet . . . . .       | 6½° > 6½°  | 7° > 7°     | 7½° > 7½°   |

At the same time the capacity of the fermenting vats per pound of stuff was changed as follows:

|                       | 1864.    | 1866.                          | 1871.          | 1876.    |
|-----------------------|----------|--------------------------------|----------------|----------|
| For dry grain stuffs. | 9 vedros | 9, 8, 7 and 6 vedros           | 7 and 6 vedros | 6 vedros |
| > green malt . . .    | 6        | 6, 5.66, 4.5 and 4             | 4.66 and 4     | 4        |
| > potatoes . . .      | 2.5      | } 2.5, 2.25, 2 and 1.75 vedros | 2 and 1.75     | > 1.75   |
| > beet. . . . .       | 2.5      |                                |                |          |

The duration of the fermentation process was fixed at three to five days. With respect to the unassessed superdistillate, its extent was made to depend not only upon the normals, but also upon the capacity of the fermenting vats chosen by the distiller. The amount of the permissible superdistillate was also gradually lowered;

in 1871 its maximum was fixed at 12 instead of 18 per cent as formerly; in 1876 it was lowered to 10, and in 1879 to 7 per cent from spirit distilled according to the higher normal.

Simultaneously with the adoption of the above measures the financial administration endeavoured, in the interest of the fisc and with the view of equalizing the conditions of the large and small distilleries, to arrive at a more accurate control over the spirit distilled. And indeed, under the diversity of the economical conditions in different parts of the Empire, and under the variety of the methods of manufacture, class of spirit-yielding stuffs, and construction of the distilleries themselves, the most equitable mode of taxation must be recognized as that which is assessed upon the actual yield of spirit. Therefore, when the regulations for the excise upon spirit were being formed, a proposal was made to compute this excise by means of controlling instruments for measuring the quantity actually produced; but it was found impossible to realize this proposal until the efficiency of such instruments had been carefully and fully tested. These researches were continued up to 1868, when it was decided as an experiment to introduce Stumpe's controlling apparatus into four of the distilleries of the northwestern governments. Owing to the favourable results obtained by this apparatus it became more generally used, but subsequently between 1873 and 1874 it was gradually replaced by Siemens's more perfect instrument, which not only determined the volume of alcoholic liquid passing through it, but also the amount of absolute alcohol it contained. At the present time all the Russian distilleries are furnished with Siemens's controlling and measuring apparatus, which is used for calculating the amount distilled.

Although, with the general introduction of these instruments for calculating the actual quantity of spirit distilled, the normals of the yield of spirit from the different stuffs lost their previous significance as the chief basis for calculating the amount of spirit subject to assessment, still these normals remained in force as the obligatory minimum yield of spirit from various stuffs, and as evidence of the regular working of the distilleries. Thus, at the present time the calculation of the excise is based upon the actual and normal yield of spirit, and upon the amount of anhydrous alcohol contained therein. These measures for a more rational estimation of the spirit actually distilled were accompanied by a rise in the excise upon spirit for the whole Empire. Thus, the excise was first raised in 1864 from four to five kopecks, then in 1869 to six kopecks, and in 1874 to seven kopecks per degree. When the excise system was introduced into Poland in 1866 the excise was fixed at 2.5 kopecks per degree, but it was afterwards raised in 1869 to 4 kopecks, in 1873 to 5.5 kopecks, and in 1876 it was made equal to that of the other parts of the Empire, namely 7 kopecks.

The above measures had the effect of decreasing the total number of distilleries, and of increasing the yield of the larger works. During 1866 to 1867 there were 3,384 distilleries working in the Empire, not including Poland and Siberia, and in 1871 to 1872 their number had decreased to 2,807, while the yield of spirit has risen from 26,525,568 vedros to 28,603,059 vedros; thus, the average yield of spirit per distillery had risen from 7,839 in 1866 to 1867 to 10,190 vedros in 1871 to 1872. The spirit industry continued to progress in the same direction, after the adoption of the excise system for twenty years, and in 1879 to 1880 there were altogether,

not including Poland and Siberia, 2,024 distilleries in operation with a total yield of 31,145,321 vedros, which form on the average an output of 15,388 vedros per distillery. With respect to the kind of spirit-yielding materials used during this period, the data bearing upon this subject indicate an almost general employment of potatoes and green malt, in preference to grain, owing to the somewhat complex conditions and requirements of the excise regulations. At the same time the manufacture of spirit from molasses made considerable progress in the beet sugar districts, while in the northern governments, Archangel and Olonets, the manufacture of spirit from lichens and moss was started. But, owing to the difficulty of collecting and transporting these materials to the distilleries, and also to the unsatisfactory results obtained, the manufacture of spirit from moss was completely given up. The distilleries made considerable progress in their technical respects, and there was no improved apparatus or process which was not applied in Russia. The direct result of this policy was the of obtaining better yields of spirit, which sometimes reached an average of 41° per pound of grain, or 17° per pound of potatoes. At the same time the old-fashioned distilleries, of which there were many on different private estates, were gradually closed, while the better installed works, even if small like those in the Baltic and north-western governments, continued to operate more or less actively.

During the third decade of the enforcement of the liquor excise system, the endeavours of the Ministry of Finance were chiefly directed in the same path as during the second decade, namely, to the regulation of the production by a limitation of the exemptions allowed upon it, and to the increasing of the Government revenue from the manufactures. With respect to the first, mention should be made of the law of June 9, 1887, establishing only two normals for grain and potato distillation, a lower and a higher, in the place of the former three normals, lower, medium and higher, namely:

|   | Lower normal. | Higher normal. |
|---|---------------|----------------|
| For different grain stuffs with the exception of green malt . . . . . | 36°           | 38°            |
| For green malt . . . . .  | 24°           | 25.30°         |
| For potatoes . . . . .  | 10°           | 12°            |

The normal for beets, the distillation of which is not practised in Russia, was abolished, and they were relegated to the number of stuffs whose normals are established by the Ministry of Finance in accordance with the results obtained by experience. One normal of 25° of anhydrous spirits per pound was established for beet molasses. As regards the non-assessed superdistillate, it was started from July 1, 1886, on the basis of the law of May 18, 1885, estimated according to the following calculation. For spirit distilled according to the higher normal, with a three days fermentation, 7 per cent of the first million degrees, only 5 per cent of the remainder were allowed as superdistillate. A corresponding diminution was made for the other normals, and for a four days fermentation. On July 1, 1888, the amount of non-assessed superdistillate was further diminished to 5 per cent for the first million degrees, and 3 per cent for the remainder of the distillate. The latter measure had partly the object of supporting the smaller distilleries, but it did not succeed in so

doing, because the restriction only touched upon one limit, the distillation of spirit to the extent of over one million degrees, without any further diminution in the corresponding extent of this reduction. With the direct object of increasing the Government revenue, the extent of the excise was gradually raised, first in 1881 to 8 kopecks, and then in 1885 to 9, and in 1888 to 9.25 kopecks.

Among the measures adopted by the Ministry of Finance for regulating the spirit industry, reference should be made to the encouragement of the exportation of spirit, with the object of enlarging the market for the Russian product. During the first half of the sixties the exportation of spirit from Russia was of a purely incidental character, and did not exceed 100,000 vedros of anhydrous spirit, the greater part of which was forwarded through Odessa to Turkey, while the remainder was sold in Germany and certain other countries. The Ministry of Finance, in order to aid the exporter, subsequently allowed certain exemptions independent of the excise system in vogue. These exemptions consisted in allowing a premium of 3 per cent upon the exportation of the refined spirit of a strength of not less than 90°, besides a certain percentage for covering the cost of transport. At first this measure was adopted as an experiment for a period of two years, but owing to its success it was continued and remained unaltered until 1883. At first, with the inconsiderable five-kopeck excise and a comparatively small superdistillate, these exemptions did not present any special attractions, but when the excise was raised in 1869, and as the superdistillate increased with the improved technical position of the distilleries, the foreign market proved very profitable. Between 1869 and 1873 the export of spirit rose to an average of 661,170 vedros per year. In 1884 the 3 per cent exportation premium was extended to spirit of all strengths, and a further premium of 3 per cent was allowed upon refined spirit of strength not below 95°, with a view to the loss incurred in its preparation.

The augmentation of the exportation premium in 1884, combined with the comparatively high excise upon spirit (8 kopecks per degree), had a powerful influence in increasing the exportation, which rose in the short space of four years to 21.8 per cent of the total production. This was due to the fact that the actual price of the spirit lost its primary importance, and the chief object of the exporter was to obtain the exportation premium. Under such a condition of affairs not only was there an excess of spirit exported, but it was manufactured specially for this object, which instead of relieving the home markets from over supply acted as a still greater encouragement to produce more. At the same time the payment of the exportation premium, in yearly increasing amounts, necessitated correspondingly increasing sacrifices on the part of the Treasury. This induced the Government to undertake corresponding measures to lessen the expenses of the State without injury to the spirit manufacture. Hence in 1887 it was found necessary to gradually decrease the exportation premium, and the good effects of this measure were not tardy in evincing themselves; the loss to the State from the exportation of spirit began to lessen every year, while the extent of the export was far from decreasing in the same degree.

Besides their chief consumption as a drink, liquors have also a somewhat wide application in many chemical and technical manufactures, partly as primary and partly as accessory materials. The Ministry of Finance, recognizing the importance of the preparation in Russia of certain chemicals only obtainable with the help of spirits,

and desiring also to place the Russian chemical works in a position to compete with the foreign laboratories enjoying spirit free of excise, found it possible to permit the sale of unassessed spirits for the preparation of ether, santonine, tannin, chloroform, chloral et cetera, with the observance of certain conditions for guaranteeing the interests of the State, and for preventing the use of non-assessed spirits for other purposes than the above. These conditions were the methylation of the spirits on the one hand, and a constant control by the excise officer, on the other.

The first exemptive measures respecting the allowance of unassessed spirits for chemical manufactures were adopted by the Ministry of Finance in 1880 as an experiment for a term of three years, and were taken advantage of by several chemical works for the preparation of ether\*. In the case of spirits for the separation of ether the term was subsequently prolonged several times, in 1883, 1887, 1889 and 1892, each time for three years. The spirit destined for the preparation of other chemical products was first exempted from excise in 1884, also for a term of three years, but the term was afterwards prolonged in 1887 and 1890. Among other industries the treatment of beet molasses, for the extraction of its sugar by the elution process, was permitted the use of unassessed spirit in 1891, while on April 27, 1891, the preparation of smokeless powder, at one of the State powder works, was added to the number of these industries.

The most important measures recently passed by the Government respecting the manufacture of spirits, were the law of June 4, 1890, for the encouragement of rural distilleries, which came into force on July 1, 1891, and that of November 23, 1892, raising the excise upon spirit to 10 kopecks per degree. The publication of the first of these laws, giving certain essential advantages to the rural distilleries, originated in the oppressed position of the latter owing to the powerful pressure brought to bear upon them by the larger and chiefly industrial distilleries. As there was no doubt but that the enforced yield of these distilleries was, to a considerable extent, supported by the non-assessed superdistillate, of which the distillers obtained more, the larger the amount of spirit they distilled, and as the lessening of the superdistillate from 5 to 3 per cent of the whole amount of spirit beyond the first million degrees was shown by experience to be insufficient, it was decided to replace the superdistillate by an exemption from excise of a certain percentage of the whole amount of spirit, independent of the normal of the yield and the period of fermentation. This measure, which did not reward the distiller for forcing the yield of his distilleries, or for obtaining high returns of spirit, but compensated him for actual losses in the form of over drying and leakage of spirit, formed the most essential point of the law of June 4, 1890. Starting from the supposition that the larger and the better constructed the distilleries were, the less the losses were sustained by them, and that it was difficult for the smaller distilleries to have costly plant, and that hence they were always liable to greater losses, the new law distributed the allowance of non-assessed spirit in conformity with the actual losses at distilleries of different dimensions, and almost in the reverse proportion to the extent of the yield of spirit, namely as follows:

---

\* Previous to this, according to the laws of July 4, 1861, and of October 31, 1866, unassessed spirits were allowed to be used only in the manufacture of spirit-turpentine lighting fluid.

|   |     |          |
|---|-----|----------|
| For the first million degrees (34,570 gallons at 94 per cent Tralles) . . . . .                 | 2   | per cent |
| For yields over one to three million degrees (103,710 gallons at 94 per cent Tralles) . . . . . | 1.5 | » »      |
| For yields over 3 to 12 million degrees (414,840 gallons at 94 per cent Tralles) . . . . .      | 0.5 | » »      |

No allowance was made for yields over 12 million degrees. Another very important clause in the law of June 4, 1890, having the immediate object of protecting the rural distilleries in general, and the smaller ones in particular, was the allowance of a further percentage free from excise in favour of the rural distilleries, but only to the amount found actually necessary to protect these distilleries from oppression on the part of the large concerns, and for supporting the smaller rural works. This additional allowance was determined as follows:

|  |     |          |
|--|-----|----------|
| For the first half million degrees (17,285 gallons at 94 per cent Tralles) . . . . .             | 4   | per cent |
| For yields from one-half to 1 million degrees (34,570 gallons at 94 per cent, Tralles) . . . . . | 2   | » »      |
| For yields from one to three million degrees (103,710 gallons at 94 per cent, Tralles) . . . . . | 1.5 | » »      |
| For yields from three to six million degrees (207,420 gallons at 94 per cent, Tralles) . . . . . | 0.5 | » »      |

No additional allowance was made for yields above six million degrees. A rural distillery was said to be one in which the manufacture of spirit was carried on for 200 work days between the 1st of September and the 1st of June, with a total yield of not over 75 vedros of spirit of 40° per each dessiatine of arable land on the estate. But in order to have the right of the additional excise exemption, the distillery must be on an estate, disposing of not less than 60 dessiatines of arable land, and the dimension of the distillery itself must be in direct proportion to the area of such land. In general the new law put a limit on the development of the large distilleries, as it, amongst other things, forbade the erection of new distilleries having a total capacity of fermentation vats of over 9,000 vedros, or the existing distilleries with that capacity of vats to increase their output above that figure, or those having a smaller capacity to increase it above 9,000 vedros. Moreover, this law forbade the erection of new distilleries in towns after July 1, 1890, and the formation of Stock Companies for the erection, or the acquisition of new distilleries by already existing Stock Companies in whose statutes the right of the erection of distilleries is not mentioned.

The same law of June 4, 1890, abolished the lower normal of the yields of spirit and the four days fermentation. Thus, after the first of July, 1891, the following normals of the yields of spirit from a poud of material remained in force:

1. From grain stuffs, and also from dry malt and maize 38°
2. From green malt . . . . . 25.33°
3. From potatoes . . . . . 12°
4. From beet sugar molasses. . . . . 25°

The duration of the fermentation was limited to three days in all distilleries.

As regards the law of November 23, 1892, by which the rate of the excise upon spirit began from December 1, 1892, it raised the rate from 9.25 kopecks per degree, or 9.25 roubles per vedro of anhydrous alcohol, that is, 1.37 dollars per American gallon of 94 per cent Trallis, to 10 kopecks per degree or 10 roubles per vedro of anhydrous alcohol, which corresponds to 1.48 dollars per gallon at 94 per cent Trallis. This measure, like the preceding augmentation of the excise, was called forth by the requirements of the Government Treasury, and the necessity of increasing the liquor revenues.

#### THE PRESENT POSITION OF THE SPIRIT INDUSTRY IN RUSSIA.

The clearest representation of the gradual development of the spirit industry to its present position, is given by an examination of the results of the enforcement of the liquor excise system since its adoption, namely from 1863 to 1892.

Among all the State imposts upon the manufacture and trade of spirituous liquors, the greatest increase during this period occurred on the introduction of the actual excise revenue, although other imposts had also risen to a considerable degree. During the last years of the existence of the leasing system, the total revenue brought to the Government by the spirit industry scarcely reached 100,000,000 roubles, but very soon after its abrogation the excise revenue alone exceeded this sum. The figures of the following table, giving the revenue from the excise upon spirit from 1863 to 1890, testify to the rapid growth of this impost, which increased nearly two and a half times during the twenty-nine years.

| YEARS.         | REVENUE.             | YEARS.                            | REVENUE.             | YEARS.                            | REVENUE.             |
|----------------|----------------------|-----------------------------------|----------------------|-----------------------------------|----------------------|
|                | Millions of roubles. |                                   | Millions of roubles. |                                   | Millions of roubles. |
| 1863 * . . . . | 106                  | 1874. . . . .                     | 175                  | 1883. . . . .                     | 223                  |
| 1864 . . . . . | 114                  | 1875. . . . .                     | 173                  | 1884. . . . .                     | 217                  |
| 1865 . . . . . | 112                  | Rate of excise 7 kop. per degree. |                      | 1885. . . . .                     | 207                  |
| 1866 . . . . . | 106                  | 1876. . . . .                     | 167                  | Rate of excise 9 kop. per degree  |                      |
| 1867 . . . . . | 121                  | 1877. . . . .                     | 167                  | 1886. . . . .                     | 209                  |
| 1868 . . . . . | 121                  | 1878. . . . .                     | 189                  | 1887. . . . .                     | 229                  |
| 1869 . . . . . | 122                  | 1879. . . . .                     | 200                  | Rate of excise 9.25 k. per degree |                      |
| 1870 . . . . . | 149                  | 1880. . . . .                     | 197                  | 1888. . . . .                     | 237                  |
| 1871 . . . . . | 156                  | 1881. . . . .                     | 205                  | 1891. . . . .                     | 247                  |
| 1872 . . . . . | 155                  | Rate of excise 8 kop. per degree  |                      | 1890. . . . .                     | 239                  |
| 1873 . . . . . | 157                  | 1882. . . . .                     | 223                  | 1891. . . . .                     | 220                  |

\* In 1863 to 1866 no excise was levied in Poland, while in the rest of the Empire it was rated in 1863 at 4 kopecks per degree, or one-hundredth part of a vedro of anhydrous spirit; at 5 kopecks per degree in 1864 to 1869, and at 6 kopecks per degree in 1870 to 1873. In Poland it was rated at 2.5 kopecks per degree in 1867 to 1869, at 4 kopecks in 1870 to 1873, at 5.5 in 1874 and 1876, and afterwards at the same rate as the rest of the Empire. Finland does not enter into the calculations.



If to these be added the license, propination, and other dues, and also the revenues brought in by vodka, liquor, beer, mead and yeast, then the entire liquor revenue for the last fourteen years is expressed by the following figures.

| Y E A R S.     | R O U B L E S. | Y E A R S.     | R O U B L E S. |
|----------------|----------------|----------------|----------------|
| 1878 . . . . . | 212,809,370    | 1885 . . . . . | 231,188,767    |
| 1879 . . . . . | 228,130,367    | 1886 . . . . . | 236,917,945    |
| 1880 . . . . . | 222,328,144    | 1887 . . . . . | 257,576,217    |
| 1881 . . . . . | 224,264,227    | 1888 . . . . . | 265,045,981    |
| 1882 . . . . . | 251,841,712    | 1889 . . . . . | 274,865,424    |
| 1883 . . . . . | 252,644,889    | 1890 . . . . . | 268,307,208    |
| 1884 . . . . . | 243,963,663    | 1891 . . . . . | 247,440,851    |

At the time of the introduction of the excise system there were 6,487 distilleries. Since the enforcement of the excise system 2,106 new works were erected, but during the same period 4,728 or 73.4 per cent of the previously existing distilleries, and 1,053 or 50 per cent of the newly erected ones, were closed; so that now there only remain 2,742 distilleries, of which 1,053 are new, and 1,689 are old. The large amount of old distilleries which ceased working is explained by the fact that the previously existing distilleries, chiefly small, did not satisfy the new requirements, and could not withstand the competition of the large concerns. The accompanying table gives the number of distilleries and their yield, that is, the average total yield of all the distilleries, and the average yield per distillery for periods of five years.

| P E R I O D.        | AVERAGE NUMBER<br>OF DISTILLERIES. | AVERAGE YEARLY<br>YIELD OF ANHY-<br>DROUS ALCOHOL, IN<br>VEDROS. | AVERAGE YEARLY<br>YIELD PER DISTIL-<br>LERY OF ANHY-<br>DROUS SPIRIT, IN<br>VEDROS. |
|---------------------|------------------------------------|--|---|
| 1866—1871 . . . . . | 4,353                              | 29,432,418   | 6,760   |
| 1871—1876 . . . . . | 3,460                              | 31,294,434   | 9,045   |
| 1876—1881 . . . . . | 2,596                              | 30,729,466   | 11,840  |
| 1881—1886 . . . . . | 2,449                              | 32,702,175   | 13,356  |
| 1886—1891 . . . . . | 2,107                              | 32,155,966   | 15,261  |

Thus, during the last twenty-five years, the number of distilleries has gradually diminished from an average of 4,353 to 2,107, while the average yield of spirit per distillery has at the same time considerably increased, from 6,760 vedros to 15,261, that is, 225 per cent; although the number of distilleries in action has fallen 59 per cent.

A closer acquaintance with the present position of the Russian liquor trade will be acquired by a review of the most important statistical, technical, and economical data with reference thereto, covering the years 1889—1890 and 1890—1891.

The distilleries themselves may be grouped into three categories according to their capacity, namely, small distilleries with a yield of not over 10,000 vedros of anhydrous spirit, 34,570 American gallons at 94 per cent Tralles; medium distilleries with a capacity of from 10,000 to 40,000 vedros of anhydrous spirit, 34,570 to 138,280 gallons at 94 per cent Tralles; and large distilleries with a yield of over 40,000 vedros, 138,280 gallons.

During the years 1889—1890, and 1890—1891, the distribution of the distilleries according to the above categories and districts was as follows:

| DISTRICTS.                | DISTILLERIES IN ACTION. |          |          |          |          |          |
|---------------------------|-------------------------|----------|----------|----------|----------|----------|
|                           | Small.                  |          | Medium.  |          | Large.   |          |
|                           | 1889—90.                | 1890—91. | 1889—90. | 1890—91. | 1889—90. | 1890—91. |
| Northern . . . . .        | 40                      | 40       | 13       | 13       | 1        | 2        |
| Eastern . . . . .         | 16                      | 16       | 27       | 25       | 21       | 24       |
| Central manufacturing . . | 60                      | 60       | 37       | 44       | 8        | 8        |
| Central Chernoziom . . .  | 26                      | 26       | 129      | 180      | 56       | 77       |
| Little Russia . . . . .   | 73                      | 74       | 64       | 63       | 12       | 12       |
| Baltic . . . . .          | 125                     | 189      | 195      | 123      | 5        | 3        |
| North-western . . . . .   | 330                     | 340      | 64       | 58       | —        | —        |
| South-western . . . . .   | 161                     | 146      | 90       | 87       | 13       | 19       |
| Southern . . . . .        | 11                      | 6        | 36       | 38       | 12       | 10       |
| Poland . . . . .          | 271                     | 255      | 112      | 122      | 1        | 1        |
| Siberia and Turkestan . . | 8                       | 10       | 29       | 26       | 9        | 9        |
| Total . . . . .           | 1,137                   | 1,162    | 796      | 729 *    | 149      | 163      |
| Per cent . . . . .        | 55                      | 56.5     | 38       | 35.5     | 7        | 8        |

As regards the number and yield of the distilleries, Russia may be divided into two great zones, the Western and Eastern. The Western includes the Baltic, north-western, south-western, Little Russia, and the Polish districts; while the Eastern zone embraces the central Chernoziom country, the central manufacturing, and the eastern districts. The distilleries may thus be grouped under the following eleven districts, embracing governments and provinces more or less similar in their industrial conditions:

1. The Northern district, including the governments of Archangel, Vologda,

\* There was, in addition to the above, one distillery in the Transcaspien provinces, producing over 20,000 vedros (69,440 gallons) of spirit.

Novgorod, Olonets, Pskov, and Petersburg; 2. The Eastern district, consisting of the governments of Viatka, Kazan, Orenburg, Perm, Samara, and Ufa; 3. The Central manufacturing district, which includes the governments of Vladimir, Kaluga, Kostroma, Moscow, Nizhni-Novgorod, Smolensk, Tver, and Yaroslav; 4. The central Chernoziom country, with the governments of Voronezh, Kursk, Orel, Penza, Riazan, Saratov, Simbirsk, Tambov, and Tula; 5. Little Russia, with the governments of Poltava, Kharkov, and Chernigov; 6. The Baltic district, including the governments of Courland, Lithuania, and Esthonia; 7. The north-western district, including the governments of Vilna, Vitebsk, Grodno, Kovno, Minsk, and Moghilev; 8. The south-western district, including the governments of Volyn, Kiev, and Podolia; 9. The southern district, including the governments of Astrakhan, Bessarabia, Ekaterinoslav, Don province, Stavropol, Tersk, Kuban, Tauride, and Kherson; 10. The district of Poland, including the governments of Warsaw, Kalish, Kelets, Lomzha, Lublin, Petrokov, Plotsk, Radom, Sedlets, and Suvalki; 11. The district of Siberia and Turkestan includes the whole of Siberia and Turkestan.

The yield of the distilleries, that is, the amount of spirit distilled, in thousands of vedros, and gallons, and the percentages of the total yield given by the distilleries of the different districts during the same periods, is given in the following table:

| DISTRICTS.                      | 1890 — 1891.                         |                               |           | 1889 — 1890.                         |                               |           |
|---------------------------------|--------------------------------------|-------------------------------|-----------|--------------------------------------|-------------------------------|-----------|
|                                 | Thousand vedros of anhydrous spirit. | American gallons 94° Tralles. | Per cent. | Thousand vedros of anhydrous spirit. | American gallons 94° Tralles. | Per cent. |
| Central Chernoziom . . . . .    | 8,868                                | 30,656,676                    | 28.4      | 8,264                                | 28,568,648                    | 26.3      |
| South-western . . . . .         | 3,707                                | 12,815,099                    | 11.2      | 3,471                                | 11,999,247                    | 10.7      |
| Poland . . . . .                | 3,293                                | 11,383,901                    | 10.6      | 3,192                                | 11,034,744                    | 10.2      |
| Baltic . . . . .                | 3,076                                | 10,633,732                    | 9.9       | 4,407                                | 15,234,999                    | 14.0      |
| North-western . . . . .         | 2,638                                | 9,119,566                     | 8.5       | 2,746                                | 9,492,922                     | 8.8       |
| Little Russia . . . . .         | 2,478                                | 8,566,446                     | 7.9       | 2,260                                | 7,812,820                     | 7.2       |
| Eastern . . . . .               | 2,236                                | 7,729,852                     | 7.3       | 2,186                                | 7,557,002                     | 7.0       |
| Central manufacturing . . . . . | 1,880                                | 6,499,160                     | 6.0       | 1,664                                | 5,752,448                     | 5.3       |
| Southern . . . . .              | 1,500                                | 5,185,500                     | 4.8       | 1,685                                | 5,825,045                     | 5.4       |
| Siberia and Turkestan . . . . . | 1,147                                | 3,965,179                     | 3.8       | 1,158                                | 4,003,206                     | 3.7       |
| Northern . . . . .              | 499                                  | 1,725,043                     | 1.6       | 417                                  | 1,441,569                     | 1.4       |
| Total . . . . .                 | 31,322                               | 108,280,154                   | 100.0     | 31,450                               | 108,722,650                   | 100.0     |

As regards the three above-mentioned categories of distilleries, the small, medium, and large, the following figures give the total and relative yields of each category:

|                             | 1890 — 1891.                     |              | 1889 — 1890.                     |              |
|-----------------------------|----------------------------------|--------------|----------------------------------|--------------|
|                             | VEDROS OF ANHY-<br>DROUS SPIRIT. | PER<br>CENT. | VEDROS OF ANHY-<br>DROUS SPIRIT. | PER<br>CENT. |
| Small distilleries. . . . . | 6,478,987                        | 20.6         | 6,436,484                        | 20.5         |
| Medium d° . . . . .         | 12,985,972                       | 41.4         | 14,509,045                       | 46.1         |
| Large d° . . . . .          | 11,857,476                       | 38.0         | 10,504,112                       | 33.4         |
| Total. . . . .              | 31,322,435                       | 100.0        | 31,449,641                       | 100.0        |

In Russia the yield of spirit depends chiefly upon the harvest, as the latter, on the one hand, determines the degree of prosperity of the chief consumers, that is, of the agricultural population; and on the other hand, the scarcity or abundance of the necessary materials for the production of spirit. During the eighties a substantial change took place in the manufacture of spirit, owing to the fact that before 1881—1882 the chief material employed was grain stuffs; and corn spirit formed over 70 per cent of the whole production. However, from that time potatoes began to predominate as a spirit-yielding material, owing to the fact that their harvest is less fluctuating than that of grain, and also because they give a greater yield of spirit per dessiatine than grain stuffs. The greatest fall in the consumption of corn, and rise in that of potatoes, occurred in 1889—1890, when the potatoes distilled amounted to 92,618,288 pounds, or 1,493,843 tons, while only 39,180,629 pounds, or 631,742 tons, of corn stuffs were treated in the manufacture of spirits. This very great reduction in the consumption of grain, and the increase in that of potatoes, was due to the bad rye harvest, and the abundant potato crop of 1889. In the succeeding year the cereal harvest improved, and therefore a somewhat larger amount, 40,425,276 pounds, or 651,810.3 tons, was consumed in the manufacture of spirits. At the same time the potato harvest was bad, and the consumption fell to 85,042,436 pounds, or 1,371,209.8 tons. Besides grain stuffs and potatoes, a certain amount of beet molasses, forming the refuse of the beet-sugar works, is annually treated in the manufacture of spirit. During 1889—1890, and 1890—1891, the total yield of spirits was produced from the following materials in the following proportions:

|  | 1890 — 1891. |           |           | 1889 — 1890. |             |           |
|--|--------------|-----------|-----------|--------------|-------------|-----------|
|  | Pounds.      | Tons.     | Per cent. | Pounds.      | Tons.       | Per cent. |
| Grain stuffs, counting 3 pounds of green malt as equivalent to 2 of rye. . . . . | 40,211,412   | 648,362   | 30.5      | 39,031,718   | 629,340.8   | 28.5      |
| Potatoes . . . . .   | 85,039,076   | 1,371,155 | 64.5      | 92,618,288   | 1,493,361.6 | 67.9      |
| Molasses . . . . .   | 6,293,716    | 101,479   | 4.8       | 4,877,277    | 78,640.3    | 3.5       |
| Other materials . . . . .  | * 218,456    | 3,523     | 0.2       | 149,923      | 2,417.3     | 0.1       |
| Total. . . . .   | 136,762,660  | 2,124,519 | 100.0     | 136,677,296  | 2,203,760   | 100.0     |

\* This includes starch, potato, spelt and acorn flour, peas, grape, Jerusalem artichokes, et cetera.

Rye flour and grain stand at the head of the corn stuffs. During 1890—1891, 25,046,675 pounds or 403,848.3 tons, and during 1889—1890, 24,127,620 pounds or 389,030 tons, of rye were distilled, chiefly in the central Chernoziom, eastern, Little Russia, central manufacturing, south-western, and Siberian governments. After rye come green and dry malt, of which, taking 3 pounds of the former as equivalent to 2 of the latter, 9,877,007 and 9,934,881 pounds, or 159,255 and 160,188 tons, were distilled during the above-mentioned periods. Then comes maize to the amount of 3,757,425 pounds, or 60,583 tons, during 1890—1891, and 3,573,345 or 57,616 tons during 1889—1890; while the remaining corn stuffs amounted to 1,530,305 pounds or 24,690 tons during 1890—1891, and 1,395,872 pounds or 22,507 tons during 1889—1890. The largest quantities of potatoes were consumed in the following governments, as shown in the table below:

|                              | 1890 — 1891. |         | 1889 — 1890. |         |
|------------------------------|--------------|---------|--------------|---------|
|                              | Pounds       | Tons.   | Pounds.      | Tons.   |
| Central Chernoziom . . . . . | 23,852,590   | 384,595 | 23,527,439   | 379,352 |
| Baltic . . . . .             | 14,475,054   | 233,393 | 23,189,343   | 373,901 |
| Poland . . . . .             | 18,367,311   | 296,151 | 19,082,609   | 307,684 |
| North-western . . . . .      | 12,501,256   | 201,568 | 13,581,723   | 218,990 |

The distillation of spirits from molasses was most developed in the governments yielding the largest amount of beet sugar, as below:

|                                 | 1890 — 1891. |        | 1889 — 1890. |        |
|---------------------------------|--------------|--------|--------------|--------|
|                                 | Pounds.      | Tons.  | Pounds.      | Tons.  |
| South-western governments . . . | 3,572,223    | 57,598 | 2,761,625    | 44,526 |
| Little Russia . . . . .         | 1,470,319    | 23,707 | 1,268,927    | 20,460 |

The distilleries working during 1890—1891 and 1889—1890 may be summarized as follows:

|   | 1890—1891. | 1889—1890. |
|---|------------|------------|
| Exclusive distilleries . . . . .            | 2,006      | 2,035      |
| Distilleries producing also yeast . . . . . | 49         | 47         |
| Total . . . . .                             | 2,055      | 2,082      |

The yeast-producing distilleries exclusively treated corn stuffs to the following amounts:

| YEARS.             | YIELD OF SPIRITS. |                              |
|--------------------|-------------------|------------------------------|
|                    | Pounds.           | Vedros of anhydrous alcohol. |
| 1890—1891. . . . . | 3,053,434         | 1,010,923                    |
| 1889—1890. . . . . | 2,814,799         | 925,479                      |

The improvement of the technical side of distillation is of great importance, as due to it a greater proportion of spirit is obtained in a shorter time and of a better quality from the same materials than with distilleries of more primitive construction. In seeking for a means of increasing the yields of spirits, and shortening the time necessary for its manufacture, the distiller first turned his attention to the possibility of an uninterrupted distillation of the wort, and a better mixing of the mash. The introduction of uninterrupted distilling apparatus considerably lessened the consumption of fuel for this purpose, and at the same time hastened the process of production of spirits. The application of steam motors for mixing the mash had a similarly favourable result, and the introduction of Heintz's steam extractor apparatus for boiling down the potatoes and grain, in the place of the former wooden steam vats with crushers, in the distillation of potatoes, hastened the treatment of the mash by at least five times, and gave the possibility of preparing very large mashes, which placed the potato spirit industry in a particularly favourable position. These successive improvements in technical respects made considerable progress, but as yet the economizing of fuel has received very little attention.

Out of the 2,055 distilleries working during 1890—1891, 439 had no boiling-down apparatus, while among the remaining 1,613 distilleries, 582 used simple wooden steam extractors, and 1,034 metallic steam extractors of high pressure. Thus, only 21.36 per cent of the total number of distilleries were without extractors, 28.32 per cent used simple wooden extractors, and 50.32 per cent, metallic extractors of high pressure. The distilleries employing the latter class of extractors predominate in the central Chernoziom governments, 90.9 per cent; in the Baltic provinces, 85.08 per cent; and in the central manufacturing governments, 62.4 per cent. The distilleries using simple wooden extractors are chiefly concentrated in the north-western governments, 64 per cent of the total number of distilleries being in that district; and of those in Poland using wooden extractors, 50 per cent. Those without extractors for boiling down the potatoes et cetera predominate in Siberia and Turkestan, 93.5 per cent; and in the south-western districts, about 62 per cent.

As regards the application of various kinds of mash vats, and appliances for crushing and bruising the materials, the number of distilleries using such vats without the above-named appliances, that is, of distilleries of a low technical grade, did not exceed 241 in 1890—1891, or 11.7 per cent of the total number. In 1889—1890 there were 284 such distilleries, or 13.6 per cent of the actual number. The majority of these distilleries were situated in the north-western region, where they amounted to 127, or 52.2 per cent of the whole number, or 32 per cent of the total number in the district. At these distilleries the mash is treated by means of simple hand shovels. At all the remaining distilleries the mash vats are furnished with stirrers,

either of simple construction or else of more perfected make, and with or without appliances for the passage of refrigerating water. Out of a total of 1,814 distilleries furnished with mash vats with stirrers, 1,175 or 64.77 per cent, had vats with simple stirrers, and 639 or 35.23 per cent, with stirrers of perfected construction. Moreover, at 568 distilleries, or 31.31 per cent, these stirrers were furnished with appliances for the passage of refrigerating water, and 71 distilleries, or 3.92 per cent, had no such appliances.

With respect to the class of motive power (horse, water, or steam) employed for moving the stirrers, the majority of works use steam power. During 1890-91 there were 1,117, or 54.36 per cent of such distilleries, the majority of which, 290 or 25.9 per cent, were situated in the Baltic provinces; Poland comes next, with 210 distilleries, or 18.8 per cent; and then the central Chernoziom governments, with 197 or 17.6 per cent. Horse power was employed at 663 distilleries, or 32.26 per cent, the greater number of which were situated in Poland, 154 or 23.23 per cent; in the south-western governments, 150 or 22.62 per cent; and in the north-western governments, 147 or 22.02 per cent. Water power was only used at 25 distilleries, that is, at 1.21 per cent of the total number. At the remaining 250 distilleries, or 12.17 per cent, the crushing was done by hand.

Distilleries may be divided into three categories, according to the method employed for cooling the boiled mash. To the first category belong the distilleries where the mash cooled in the vats themselves, either by simple means of ice or snow, or else by means of special appliances for the passage of cold water. During 1890-91 there were 672 such distilleries, or 32.7 per cent of the total amount. The majority of these distilleries, that is, 253 or 12.8 per cent, were situated in the Baltic provinces; 238 of these had vats furnished with appliances for the passage of water, while at 15 the cooling was done by the throwing in of ice or snow. There was also a considerable number, 89, of such distilleries in Poland, and 74 in the north-western governments. To the second category belong those distilleries which employ cooling pans, cooling rods, or simple wooden vats placed outside the distillery buildings. These distilleries predominate, there being 1,317, or 64.08 per cent, of the whole number; furthermore, at 691 distilleries the vats or cooling rods were furnished with stirrers, while at the remaining 626 there were no stirrers. The distilleries of the second category predominated in the north-western region, there being 319 out of 398, or 80.1 per cent; in Poland 274 out of 378, or 72.5 per cent; in the south-western region, 215 out of 252, or 85 per cent; in the central Chernoziom districts, 173 out of 231, or 75 per cent; in Little Russia, 110 out of 149, or 73.9 per cent.

To the third category belong the distilleries with specially constructed, and in the majority of cases, tubular condensers; these distilleries are in the minority, and in 1890-91 did not exceed 66, or 3.21 per cent of the whole. The majority of these works were situated in Poland and the Baltic provinces, where there were 15 and 10 respectively.

The most generally adopted form of distilling apparatus is the common still, as is seen by the fact that in 1890-91, out of the total number of 2,055 distilleries, 1,190 or 58 per cent worked with different kinds of simple stills; while continuous-acting stills were only employed at 865 distilleries, or 42 per cent of the total number. The distilleries employing common stills were chiefly distributed as follows: in the north-western region, 357 or 17.3 per cent; in Poland, 253 or 12.3 per cent; and in

north-western region, 197, or 9.6 per cent; and in the Baltic provinces, 106 or 5.1 per cent. Taking the percentage relation of the total number of distilleries in each district, and of the number of those employing common stills in those districts, the following results would be obtained: in the north-western region, 89.7 per cent; in the south-western region, 78.1 per cent; in the northern region, 75.5 per cent; in Poland, 66.9 per cent; in Little Russia, 56.3 per cent. As regards the continuous-acting stills, out of a total of 865 distilleries using this system, 714 employed single column stills and 107, double column stills; 42 distilleries possessed the Illhis, and two, one in the government of Tula and the other in eastern Siberia, worked with Coffey's stills. The distilleries having continuous-acting stills are distributed as follows according to the different districts: in the Baltic provinces, 209 distilleries or 24.2 per cent; in the central Chernoziom district, 195 distilleries or 22.5 per cent; in Poland, 125 distilleries, or 14.5 per cent.

The percentage relation of the number of distilleries employing continuous-acting stills to the total number of distilleries in each district is as follows: in the central Chernoziom district, 84.4 per cent; in the eastern district, 76.9 per cent; in the Baltic provinces, 66.3 per cent; in the southern district, 55.6 per cent; in Siberia and Turkestan, 54.3 per cent.

The fuel employed by the distilleries is of various kinds, wood, coal, peat, straw, and naphtha refuse; but wood still predominates, and in 1890-91, formed the sole fuel used in 1,565 distilleries, that is, 76.1 per cent of the total. Then follow the distilleries using mixed fuel, wood and coal, or coal and peat, or wood and straw, of which there were 300 or 14.9 per cent; and sixty-nine, or 3.4 per cent, burned coal alone; these were principally situated as follows: in Poland 26, and in the southern district, 14 distilleries. Peat alone was used in 73 distilleries, or 3.55 per cent, of the entire number, and chiefly in Poland in 47 distilleries, and in the central Chernoziom governments in 17 distilleries. Straw alone was used in 31 distilleries, or 1.5 per cent, and mainly in the south-western district, in 15 distilleries. Lastly, naphtha refuse was employed in 17 distilleries, or 0.82 per cent of the total, and chiefly in the central Chernoziom district, in 11 distilleries.

A comparison of the distilleries of different dimensions, and in different parts of the Empire, shows that the cost of the fuel consumed at the small distilleries varies between 1.59 and 17.44 kopecks per vedro of distilled spirits at 40°, that is, between 6.46 and 43.6 kopecks per vedro at 100°, or 0.58 and 6.5 cents per gallon at 94 per cent Tralles. At the middle-sized distilleries, the consumption of fuel varies between 1.74 and 20.7 kopecks per vedro of spirit at 40°, that is, between 4.35 and 50.17 kopecks per vedro at 100° or 0.64 to 7.5 cents per gallon at 94 per cent Tralles. At the large and generally better-constructed distilleries this difference is not so great, and the average consumption of fuel is less than at the small and medium-sized works.

In direct connection with the question of the technical position of the distilleries stands that of the technical capacity and education of the persons employed in the industry. However, the majority of those who work in Russian distilleries have not received any special technical education, but only have a practical experience at the local distilleries. Out of the 2,055 distilleries, in work during 1890-91, only 74 or 3.6 per cent were managed by distillers who had a scientific education; the



remaining 1,981 distilleries, or 96.4 per cent, were managed by practical men of no previous technical training. The total number of operatives employed at the distilleries during 1890-91 was 1,915, out of which 1,779 were men, 28 women, and 108 minors. The average number of operatives employed per distillery varied in the different districts, between 6 in Poland and the Baltic provinces, to 41 in Siberia and Turkestan.

The cost of manufacture is mainly determined by the cost of the spirit-yielding stuffs, and of fuel. Besides this, it depends to a considerable extent upon the following factors: the fixed and circulating capital, the number of labourers and other servants, the consumption of fuel, the repairs of the works, the preparation of the materials, the Government taxes, insurance, office and other expenses. Data collected at a large number of distilleries in various parts of the Empire show that the average cost of production per degree of anhydrous spirits is, not counting the spirit-yielding stuffs, 0.75 kopeck, or 75 kopecks per 100°, or 11.1 cents per gallon at 94 per cent. If the spirit-yielding stuffs be included, the cost of production comes to 1.75 kopecks per degree, or 1.75 roubles per 100°, or 26 cents per gallon at 94 per cent Tralles.

#### THE RECTIFICATION OF SPIRITS.

The chief destination of spirit is as a beverage in one or another form, and in Russia all its other uses are comparatively very inconsiderable. But the spirit obtained from the immediate distillation of the wort contains, according to the kind of stuff used and the mode of distillation, a greater or less amount of foreign substances, which lower its quality. Hence, in order to separate these impurities from the raw spirits, it is necessary to subject it to a repeated and fractional distillation, and to separate the products of the new distillations, setting apart those which are the purest, and subjecting the remainder to redistillation. This is done in special distilling apparatus, with dephlegmation columns, chiefly of the Sa Valle system, at special spirit refining, or at corn spirit works.

The entire separation of the raw spirit from the presence of fusel oil can only be accomplished by repeated distillation, and then the distillates obtained at different stages of the operation are of different degrees of purity and strength. The purest spirit, or the first quality prime, is obtained at the middle of the distillation, and the second and third qualities before and after the first quality, with a greater or less amount of fusel oil. These two qualities are subjected separately, or together with raw spirit, to a fresh distillation, in which the prime spirit is again set apart, and the poorest quality, or mixture of the fusel oil from the different distillates, is concentrated and collected separately. The results of the distillation depend chiefly upon the quality of the raw spirit, but in general are as follows:

| Quality.              | Strength. | Amount in percentage. |
|-----------------------|-----------|-----------------------|
| 1. 3rd quality. . . . | 90.5      | 6                     |
| 2. 1st > . . . .      | 95.6      | 71                    |
| 3. 3rd > . . . .      | 72.2      | 4                     |
| 4. 2nd > . . . .      | 95.5      | 2                     |
| 5 > » . . . .         | 92.2      | 6                     |
| 6. Fusel-oil. . . .   | 29.1      | 0.2                   |

Owing to the great importance to the public health of the sale of the purest possible spirit, a law was published June 2, 1888, for the purpose of encouraging and protecting the rectification industry. The substance of this law, which made a radical change in the Russian spirit industry, consists in respect to hot and cold purification of spirit in the following features: The purification of raw spirit by the hot process, that is, by rectification, may be conducted at the distilleries producing it, without the levying of any special license; the installation of boilers for driving off the spirit held in the charcoal in the cold process, that is, by filtration through charcoal, may be sanctioned by the Ministry of Finance, also without any special license; the refuse remaining from the purification, both by the hot and cold process, may be presented to the excise officer for destruction, with the payment of an excise of one kopeck per degree upon the whole amount of spirit lost in the distillation, under the condition, however, that this amount shall not exceed 2.25 per cent of all the products of rectification, or 1.5 per cent of the whole amount of spirit passed through the controlling gear. Thanks to these practical measures, the spirit refining industry has lately begun to develop somewhat rapidly, and in 1890-91 was in the following position. With the exception of the Amour and littoral provinces, the purification of spirit in the Empire was carried on at 4,301 localities, of which 4,061 worked by the cold and 240 by the hot process. The first category included 880 distillery basements, and 3,181 wholesale stores. Of the localities where the hot process was used, 35 were special refining works, 77 were spirit-refining departments of distilleries, 70 were similar departments of corn spirit works, and 58 were distilleries not having rectifying apparatus in a special section of their buildings. The localities carrying on the purification of spirit by one or the other process, were distributed as follows:

| D I S T R I C T S.              | LOCALITIES CARRYING ON THE PURIFICATION OF SPIRIT. |         |                      |         |
|---------------------------------|--|---------|----------------------|---------|
|                                 | By the hot process.                                |         | By the cold process. |         |
|                                 | 1890—91  | 1889—90 | 1890—91              | 1889—90 |
| Southern . . . . .              | 11   | 13      | 802                  | 1,046   |
| Central Chernoziom . . . . .    | 32   | 39      | 771                  | 802     |
| North-western . . . . .         | 6  | 5       | 552                  | 479     |
| Little Russia . . . . .         | 12   | 15      | 387                  | 412     |
| Central manufacturing . . . . . | 7  | 6       | 337                  | 347     |
| Eastern . . . . .               | 26   | 28      | 223                  | 207     |
| Nothern . . . . .               | 3  | 3       | 140                  | 108     |
| South-western . . . . .         | 19   | 19      | 21                   | 94      |
| Western Siberia . . . . .       | 2  | 2       | 133                  | 214     |
| Baltic . . . . .                | 50   | 52      | 74                   | 75      |
| Caucasus . . . . .              | 2  | 2       | 81                   | 89      |
| Poland . . . . .                | 54   | 57      | 27                   | 22      |
| St. Petersburg . . . . .        | 13   | 12      | 61                   | 62      |
| Total . . . . .                 | 237  | 253     | 3,709                | 3,956   |

Besides the above mentioned localities, in 1890 to 1891 the purification of spirit was carried on by the hot process at three works in Turkestan, and by the cold process at four basements of distilleries, and at 28 wholesale stores in Turkestan, and 15 distillery basements and 305 wholesale stores in eastern Siberia. The total amount of raw spirits subjected to rectification during 1890—91 was 483,330,461° while 147,247,586° of 2nd, 3rd, 4th and 5th quality spirit and ethers were subjected to secondary distillation, or in all 630,578,047°. The controlling apparatus indicated 658,910,731°. The total amount of products of rectification destined for sale was 504,663,783°, the greater part of which, 412,103,247° or 81.66 per cent, was 1st quality spirit; 2nd to 5th quality spirits were obtained to the amount of 92,509,037° or 18.33 per cent, while ethers were produced exclusively in Poland, to the amount of 51,499° or 0.01 per cent. During 1889—90 the results of the rectification of spirit were as follows: raw spirit subjected to secondary distillation 369,480,247°; 2nd, 3rd, 4th, and 5th quality spirits and ethers subjected to secondary distillation 118,355,485°. total 486,835,732°; controlling apparatus indicated 493,690,607°. Altogether 391,977,145° of rectified spirits were prepared for sale, out of which 321,194,503°, or 81.94 per cent, were first quality spirit, and 70,743,762°, or 18.05 per cent, 2nd to 5th quality spirit; while 38,880°, or 0.01 per cent, of ethers were exclusively produced in Poland.

A comparison of the above data for the rectification of spirit during 1890 to 1891, and 1889, to 1890 shows that in the first period the total quantity of spirit subjected to rectification exceeded that rectified during 1889 to 1890 by 29.3 per cent; that the amount of raw spirit refined was greater by 30.8 per cent; of 2nd and 5th quality spirits and ethers, by 24.4 per cent, and that the amount of spirit indicated by the controlling apparatus increased by 32.5 per cent. The total amount of rectification products put upon sale was greater by 28.3 per cent, 2nd to 5th quality spirit by 30.8 per cent, and ethers by 32.5 per cent.

As regards the actual loss of spirit in the process of rectification in 1890 to 1891, it amounted to 7,866,254° or 1.69 per cent, and in 1889 to 1890 to 6,276,845° or 1.69 per cent of the raw spirit subjected to rectification; while in 1888 to 1889 this loss even amounted to 1.89 per cent. Thus, the percentage of spirit lost during rectification has gradually increased; namely, the following amounts of raw spirit were deducted to cover this loss:

|                 |            |         |                        |
|-----------------|------------|---------|------------------------|
| 1888—89 . . . . | 2,783,936° | or 1.25 | per cent of raw spirit |
| 1889—90 . . . . | 4,584,962° | » 1.24  | » » » » »              |
| 1890—91 . . . . | 6,978,201° | » 1.26  | » » » » »              |

The refuse obtained during the same periods was as follows:

|                 |            |          |                        |
|-----------------|------------|----------|------------------------|
| 1888—89 . . . . | 2,769,806° | or 1.229 | per cent of raw spirit |
| 1889—90 . . . . | 4,015,100° | » 1.087  | » » » » »              |
| 1890—91 . . . . | 5,318,537° | » 1.100  | » » » » »              |

#### THE MANUFACTURE OF DRINKING SPIRITS OR VODKAS.

The manufacture of vodkas is intimately connected with the rectification industry, and is only permitted at special vodka works. Previous to the publication of

the vodka law of 1879, distillery basements and wholesale stores were only permitted to dilute the spirit, and to purify it by the cold process by filtration through charcoal; and moreover the strength of the spirit was required to be not under 40° Tralles. At vodka works, however, the strength of the article was not subject to control, and the addition of decoctions and of fruit essences to the spirit was allowed. Under this condition of affairs a low-proof liquor came into circulation under the name of «special vodkas», instead of the true vodka spirit; and moreover, this low-proof spirit was sold in such large quantities that it could but produce a decrease in the Government revenues, although in 1878 the number of vodka works reached 1,518. A new law respecting this matter, and brought into force on the 1st January, 1879, only permitted the sale of vodka liquors in glass vessels and with corresponding banderoles, on the estimation of a supplementary excise of 1 rouble per vedro of spirit at 40°, the supervision of the placing of the banderoles upon the vessels being laid upon the excise office. From that time the vodka manufacture began by degrees to separate itself from the refining of simple spirit, which as before was permitted at distillery basements and stores. At the same time the number of vodka works began to decrease rapidly. Already in the first year of the enactment of the new law 421 works closed, and in 1880 there only remained 596. This continued to be the case subsequently, so that in recent years there only remained the following number of vodka works in the Empire:

|                   |     |                   |     |
|-------------------|-----|-------------------|-----|
| 1886—87 . . . . . | 322 | 1889—90 . . . . . | 264 |
| 1887—88 . . . . . | 300 | 1890—91 . . . . . | 250 |
| 1888—89 . . . . . | 267 |                   |     |

As regards the production of these works, at first it decreased with the number of works, and this continued to be the case until the first of January, 1886, when the law of December 9, 1885, came into force. This law treated of the preparation and sale of vodkas and had the object of ameliorating the position of the industry. In 1879 the above mentioned works yielded 1,747,002 vedros of various vodka liquors, while during 1885—86, only 1,165,842 vedros were produced. After the enactment of the above-mentioned law, the production of vodkas began slowly to increase, as also the average yield of the works.

| Y E A R.          | Number of works. | Yield of vodka. | Average yields. |
|-------------------|------------------|-----------------|-----------------|
| 1886—87 . . . . . | 322              | 1,162,108       | 3,609           |
| 1887—88 . . . . . | 300              | 1,177,651       | 3,926           |
| 1888—89 . . . . . | 267              | 1,275,684       | 4,778           |
| 1889—90 . . . . . | 264              | 1,367,183       | 5,179           |
| 1890—91 . . . . . | 250              | 1,319,122       | 5,277           |

The greatest number of vodka works were concentrated, in 1890—91, in the Baltic governments and Poland, namely, 86 or over one-third of the total num-

ber of works; and also in the eastern and central Chernoziom governments, namely 63 works, and in the Petersburg and Moscow governments, namely 28 works. The least number of distilleries were in the south-western governments, in the Turkestan and Transcaucasian regions, and in the Little Russia governments. As regards the yield of vodka liquors, the first place belongs to the governments of Petersburg and Moscow, where in 1890—91, 28 vodka works produced 672,888 vedros of vodkas; then comes Poland with 156,234 vedros from 42 works, the Baltic governments with 108,888 vedros from 44 works, the eastern governments with 102,336 vedros from 33 works, et cetera. The smallest production was given by the region of Turkestan with 2,232 vedros for 2 factories, the Little Russia governments with 5,984 vedros for 5 works, and the south-western governments with 7,410 vedros for 2 works.

#### THE CONSUMPTION OF SPIRITS.

During the first years of the introduction of the excise system the total consumption of spirit in the Empire, not including Poland, was twenty-five million vedros of anhydrous alcohol. This figure was subsequently subject to a small fluctuation, and at the end of the seventies the total consumption of the country was twenty-nine million vedros. Subsequently, notwithstanding the territorial enlargement of the Empire, the annexation of new provinces, and the natural growth of the population, the consumption of spirit began gradually to decrease; and this is seen particularly clearly from the data giving the consumption per head. At the beginning of the sixties, the consumption per head for the Empire, not including Poland, was 0.37 vedro of anhydrous spirit, and at the end of the seventies this figure had fallen to 0.34 vedro. In recent years the amount of the total consumption, and consumption per head, has still further decreased, as is seen from the following data for the last nine years.

| Y E A R.       | Consumption<br>per head;<br>vedros of<br>anhydrous<br>spirit. | Y E A R.       | Consumption<br>per head;<br>vedros of<br>anhydrous<br>spirit. | Y E A R.       | Consumption<br>per head;<br>vedros of<br>anhydrous<br>spirit. |
|----------------|---|----------------|---|----------------|---|
| 1883 . . . . . | 0.33  | 1886 . . . . . | 0.27  | 1889 . . . . . | 0.25  |
| 1884 . . . . . | 0.30  | 1887 . . . . . | 0.26  | 1890 . . . . . | 0.23  |
| 1885 . . . . . | 0.28  | 1888 . . . . . | 0.26  | 1891 . . . . . | 0.19  |

The reason of this constant decrease in the consumption per head is undoubtedly to be found in the rise in the price of the spirit under the influence of the high excise; although very likely other circumstances had their effect, however not to such an extent. The consumption per head in the different districts varied considerably, as can be seen from the following data for 1891.

| R E G I O N S.               | CONSUMPTION OF SPIRITS,<br>IN VEDROS. |           |
|------------------------------|---------------------------------------|-----------|
|                              | Total.                                | Per head. |
| Metropolitan . . . . .       | 2,647,961                             | 0.64      |
| Northern . . . . .           | 731,460                               | 0.16      |
| Eastern . . . . .            | 1,698,327                             | 0.12      |
| Central industrial . . . . . | 2,330,131                             | 0.23      |
| Central Chernoziom . . . . . | 3,547,726                             | 0.18      |
| Little Russia . . . . .      | 1,570,899                             | 0.20      |
| Baltic . . . . .             | 513,642                               | 0.21      |
| North-western . . . . .      | 1,643,107                             | 0.18      |
| South-western . . . . .      | 2,341,403                             | 0.28      |
| Southern . . . . .           | 3,480,579                             | 0.28      |
| Poland . . . . .             | 1,537,972                             | 0.17      |

## THE EXPORTATION OF SPIRITS.

Spirit forms one of the most important items of foreign export from Russia. Thus, in 1886 and 1887, the amount of liquors exported exceeded six million vedros, 19.5 million gallons, of anhydrous alcohol; and only a slight fall in this export has been observable in very recent years. According to the data for the ten years ending 1890, the export of spirit is expressed by the following figures.

| Y E A R.           | EXPORTED ANHYDROUS<br>SPIRITS. |            | Y E A R.           | EXPORTED ANHYDROUS<br>SPIRITS. |            |
|--------------------|--------------------------------|------------|--------------------|--------------------------------|------------|
|                    | Vedros.                        | Gallons.   |                    | Vedros.                        | Gallons.   |
| 1881 . . . . .     | 822,784                        | 2,674,048  | 1886 . . . . .     | 6,150,823                      | 19,990,175 |
| 1882 . . . . .     | 2,400,308                      | 7,801,001  | 1887 . . . . .     | 6,496,981                      | 21,115,186 |
| 1883 . . . . .     | 3,066,978                      | 9,967,678  | 1888 . . . . .     | 5,335,443                      | 17,340,190 |
| 1884 . . . . .     | 2,324,830                      | 7,555,697  | 1889 . . . . .     | 3,982,498                      | 12,943,119 |
| 1885 . . . . .     | 3,778,768                      | 12,280,996 | 1890 . . . . .     | 4,219,764                      | 13,714,233 |
| Total for 5 years. | 12,393,668                     | 40,279,420 | Total for 5 years. | 26,185,509                     | 85,102,903 |
| Averages . . .     | 2,478,734                      | 8,055,884  | Averages . . .     | 5,237,102                      | 17,020,581 |

In 1891 the export of spirits from Russia amounted to 3,980,289 vedros, 12,935,939 gallons; hence there was a fall of 239,475 vedros, 778,294 gallons, or 5.7 per cent as compared with 1890. The relation between the total production and the export in 1890 was 13.9 per cent while in 1891 it was 12.6 per cent. The export of spirits from the different districts in 1891 and 1890 was as follows.

| GOVERNMENTS.        | ANHYDROUS SPIRITS EXPORTED. |              |           |           |              |           |
|---------------------|-----------------------------|--------------|-----------|-----------|--------------|-----------|
|                     | In 1891.                    |              |           | In 1890.  |              |           |
|                     | Vedros.                     | Gallons.     | Per cent. | Vedros    | Gallons.     | Per cent. |
| Poland . . . . .    | 1,178,378                   | 3,829,728.5  | 29.6      | 1,250,546 | 4,064,274.5  | 29.6      |
| South-western . . . | 766,095                     | 2,489,808.7  | 19.2      | 597,316   | 1,941,277.0  | 14.15     |
| Baltic . . . . .    | 569,731                     | 1,851,625.8  | 14.3      | 1,573,883 | 5,115,119.8  | 37.30     |
| North-western . . . | 515,005                     | 1,673,766.2  | 13.0      | 331,893   | 1,078,652.2  | 7.90      |
| Central Chernoziom. | 488,686                     | 1,588,229.5  | 12.3      | 137,071   | 445,480.8    | 3.25      |
| Little Russia . . . | 431,484                     | 1,402,323.0  | 10.8      | 307,563   | 999,579.7    | 7.30      |
| Eastern . . . . .   | 19,827                      | 64,437.7     | 0.5       | —         | —            | —         |
| Southern . . . . .  | 11,083                      | 36,019.8     | 0.3       | 21,492    | 69,849.0     | 0.50      |
| Total . . . . .     | 3,960,289                   | 12,935,939.2 | 100       | 4,219,764 | 13,714,233.0 | 100       |

Thus in 1891, 29 per cent of the whole export fell to the Polish region, about 19.2 per cent to the south-western, 14.3 per cent to the Baltic, and 13 per cent to the north-western; altogether the western zone of the Empire furnished 75 per cent of the entire export, while in 1890 this region sent abroad about 90 per cent of the spirit exported, owing chiefly to the considerable shipments from the Baltic governments, which in that year supplied 37.3 per cent of the total export instead of 14.3 per cent as in 1891.

The greatest demand for Russian spirit comes from Germany which in 1891 received 67.9 per cent of the total export; after Germany comes Turkey, to which 12.2 per cent is forwarded, Sweden 7.3 per cent, Great Britain 5.5 per cent, Bulgaria 2.5 per cent, France 2.4 per cent, as is seen from the following data respecting the movement of spirit from Russia in 1891 and 1890.

| C O U N T R I E S.      | E X P O R T O F S P I R I T S. |             |           |             |
|-------------------------|--------------------------------|-------------|-----------|-------------|
|                         | In 1891.                       |             | In 1890.  |             |
|                         | Vedros.                        | Gallons.    | Vedros.   | Gallons.    |
| Germany . . . . .       | 2,703,761                      | 8,787,223.2 | 2,511,432 | 8,162,154.0 |
| Turkey . . . . .        | 485,368                        | 1,577,449.0 | 562,951   | 1,829,590.8 |
| Sweden . . . . .        | 291,237                        | 946,520.2   | 615,569   | 2,000,599.2 |
| Great Britain . . . . . | 217,181                        | 705,838.3   | 276,135   | 897,438.8   |
| Bulgaria . . . . .      | 99,320                         | 322,790.0   | 130,280   | 423,410.0   |
| France . . . . .        | 97,867                         | 318,067.8   | 10,633    | 34,557.2    |
| Egypt . . . . .         | 65,603                         | 213,209.7   | 61,132    | 198,679.0   |
| Denmark . . . . .       | 10,686                         | 34,729.5    | 25,776    | 83,772.0    |
| Greece . . . . .        | 8,466                          | 27,514.5    | —         | —           |
| Belgium . . . . .       | 555                            | 1,801.8     | —         | —           |
| Holland . . . . .       | —                              | —           | 12,936    | 42,042.0    |

As regards the export to Germany it should be remarked that the spirit sent there is chiefly forwarded to Hamburg, whence it goes to other countries, chiefly to Spain.

The exportation of specially refined spirits since 1885 was as follows :

|                      | ANHYDROUS SPIRITS. |             | PER CENT OF RE-FINED SPIRITS TO THE TOTAL EXPORT. |
|----------------------|--------------------|-------------|---|
|                      | Vedros.            | Gallons.    |   |
| 1885. . . . .        | 669,637            | 2,176,320.2 | 17.7  |
| 1886. . . . .        | 863,291            | 2,805,695.8 | 14.0  |
| 1887. . . . .        | 885,932            | 2,879,279.0 | 13.6  |
| 1888. . . . .        | 994,010            | 3,230,532.5 | 18.6  |
| 1889. . . . .        | 871,209            | 2,831,429.2 | 21.8  |
| 1890. . . . .        | 1,024,183          | 3,328,594.8 | 24.3  |
| Average for 6 years. | 884,710            | 2,875,307.5 | 17.7  |
| 1891. . . . .        | 887,160            | 2,883,270.0 | 22.3  |

Thus, compared to 1890, the export of refined spirits in 1891 fell by 137,023 vedros, 445,324.8 gallons, or by 13.4 per cent; still it was somewhat above the average for the six years period given above; its relation to the total amount of spirit exported was the most favourable of all the preceding years, with the exception of 1890.

Besides raw and refined spirit a certain quantity of vodka liquors are annually shipped abroad. In 1890 and 1891, the export of these liquors was expressed by the following figures, in degrees and gallons of anhydrous spirit:

|              | Degrees. | Gallons. |
|--------------|----------|----------|
| 1890 . . . . | 258,236  | 8,392.2  |
| 1891 . . . . | 325,310  | 10,572.6 |

The greater portion, namely 95.8 per cent in 1890, and 90 per cent in 1891, of these liquors were exported through the Riga customhouse.

#### THE MANUFACTURE OF SPIRITS FROM GRAPES AND FRUITS.

Besides the manufacture of spirit from starchy materials, such as corn stuffs and potatoes, and from non-starchy materials, such as beet sugar molasses, there is an entirely separate branch of the spirit industry in Russia, which treats such materials as grapes, raw fruits, and berries, and the refuse from the preparation of wines. This industry, which is carried on partly as an independent, and partly as a branch manufacture in the preparation of wines, is most developed in the Caucasus, in the Transcaucasian region in the province of Tersk, and in the government of Stavropol, and also in Bessarabia, the Crimea, and in Turkestan.

In 1890—1891 the total number of fruit and grape spirit distilleries in the above and certain other localities, such as the governments of Kherson and Ekate-



Ekaterinoslav and province of the Don Cossacks was 2,641, but of these only 70, or 2.6 per cent, were large industrial concerns, partly steam with more or less perfected plant. The remaining 2,571, or 97.4 per cent, were small rural and almost exclusively oven distilleries, consisting of a small copper still with a movable cover and luted in a stove, and of a worm condenser immersed in a vat containing water or else a condenser in the form of a long straight tube placed in a gutter, also containing water. Very often in the Transcaucasian region such a distillery is erected under the open sky without even an awning over it, and in case of need can be easily transported from place to place.

The materials used for the preparation of spirit at the fruit distilleries are mainly the grape, that is, the juice and husk, the juice alone or together with the lees, and other refuse, or else wine itself, and in some parts of Transcaucasia mulberries are used in rather large quantities. As regards other fruits and berries their employment in the manufacture of spirit is far more limited than the above-mentioned materials.

During 1890-91 the above-mentioned 2,641 distilleries yielded 38,572,242° of spirit, or 1,333,442 gallons at 94° Tralles. A considerable portion of this, namely, 16,785,466°, or 580,274 gallons, or 43.1 per cent of the entire production, was manufactured in the Transcaucasian region; and a slightly less amount, 15,036,812° or 519,823 gallons at 94° Tralles, or 38.9 per cent of the entire production, was produced in the province of Tersk and government of Stavropol.

At the remaining localities, namely in the governments of Bessarabia, Taurid, Kherson, and Ekaterinoslav and in the province of the Don Cossacks, 6,749,964° or 233,346 gallons of spirit at 94° Tralles were distilled. Out of the 16,785,466° of spirit distilled in the Transcaucasian region, 12,238,694°, or 423,092 gallons at 94° Tralles, were prepared from grapes, and 4,546,772°, or 157,179 gallons at 94° Tralles, from other fruits, almost exclusively mulberries. The Transcaucasian region also stands first in respect to the number of distilleries, there being 2,398 or 90.80 per cent of the total number; then comes the Taurid government with 139 distilleries or 5.3 per cent, the northern Caucasus with 82 distilleries or 3.1 per cent, the government of Bessarabia with 11 distilleries or 0.4 per cent, and Turkestan with 8 distilleries or 0.3 per cent, while the remaining localities possessed one each.

Up to December 1, 1892, the spirit distilled from grapes, grape wine, and raw fruits and berries, was subject throughout the Empire to an excise of 6 kopecks per degree, or 6 roubles per vedro, that is, 89.3 cents per gallon at 94° Tralles. But on the expiration of that term the law of the 23rd November, 1892, came into force; this law raised the excise throughout the Empire, with the exception of the Caucasus, to 7 kopecks per degree, or 7 roubles per vedro, that is, 1.042 dollars per gallon at 94° Tralles. In the Caucasus this excise law came into force on June 1, 1893. With respect to the estimation of the yield of spirits by the excise, this is done in the more perfected distilleries having rectification and dephlegmation appliances, by means of controlling alcoholmeters, chiefly of the Steemp system; but at those distilleries which possess only oven stills the spirit is estimated by means of normal yields from the various materials in different localities, calculated per vedro of capacity of the still per day. Besides this, in certain localities, namely in the Crimea, the province of the Don Cossacks, and in the Artvinsk and Ba-

town districts of the government of Kutais, the dues upon the fruit and grape spirits distilled at the small rural distilleries are levied, not in the form of an excise but, as a special license tax, to the amount of 1 rouble 50 kopecks to 2 roubles per vedro capacity of the stills for the whole period of production.

In recent times the manufacture of grape spirit has attracted serious attention, as a material for the preparation of cognac. This industry is mainly concentrated in the wine-producing districts, namely at Kizliar in the province of Tersk, in the Transcaucasian region, in Bessarabia and in the Crimea, and even outside these districts, as at Warsaw for instance. In these localities special works have been erected for the purpose, but as yet the production is very inconsiderable and may be said to be in its infancy.

The introduction of this industry into Russia dates from the middle of the present century, and the locality of its birth may be said to be the Kizliarsk wine-growing district, where a grape spirit was first prepared under the name of «kizliarka», which enjoyed a great renown, and was transported over the Empire in rather large quantities. From data collected at that time it is seen that in 1863 the export of kizliarka amounted to 10,000 vedros, and that it was locally employed for strengthening the wine. With the introduction of the present system of excise, the price of corn spirit fell, and the result of competition was the discovery of methods for purifying it from fusel oil. Owing to this the demand for kizliarka diminished year by year, and at the end of the sixties it had entirely stopped. It was not until the second half of the eighties that certain of the Kizliarsk wine growers again began to distill kizliarka for the purpose of transforming it into cognac, and they have continued to do so until now.

In the majority of cases the spirit is prepared from the settled and clarified juice, and the distillation is almost exclusively conducted in primitive furnace stills, which at first give a weak liquor of not above 30°, which is converted into a strong spirit of sometimes 72° by a second distillation.

The following table gives the total production of grape spirit at the furnace distilleries in the Kizliarsk district between 1884 and 1891.

| YEARS.              | DEGREES OF ANHYDROUS SPIRIT. | YEARS.              | DEGREES OF ANHYDROUS SPIRIT. |
|---------------------|------------------------------|---------------------|------------------------------|
| 1884—1885 . . . . . | 26,000°                      | 1888—1889 . . . . . | 1,559,334°                   |
| 1885—1886 . . . . . | 221,784                      | 1889—1890 . . . . . | 819,857                      |
| 1886—1887 . . . . . | 1,088,000                    | 1890—1891 . . . . . | 6,776,547                    |
| 1887—1888 . . . . . | 1,628,256                    |                     |                              |

The cognac and cognac spirit exported from Kizliar goes chiefly to the Nizhni-Novgorod market to which the following amounts were sent between 1888 and 1891:

|                |          |
|----------------|----------|
| 1888 . . . . . | 292,502° |
| 1889 . . . . . | 73,374   |
| 1890 . . . . . | 38,954   |
| 1891 . . . . . | 182,793  |

The strength of this spirit is not under 55° Tralles in order that it might be bought by the vodka merchants for bottling and sale without labels, and without the payment of a supplementary excise.

Besides to the Nizhni-Novgorod Fair, the grape spirit is sent from Kizliar in the form of cognac to other localities such as Moscow, St. Petersburg, Warsaw and Tiflis. In Transcaucasia the production of high quality vodka from grape wine, or the pure grape juice, has only lately emerged from its experimental stage. At the present moment there are cognac works at Erivan, Tiflis, each of which possesses one distillery, and in the village of Agdam in the Shoushin district of the government of Elizavetpol, where there are two works. At all these factories the stills are furnace stills with dephlegmators, and the material used chiefly consists of the local, and partly imported grape wine from other parts of the Caucasus, while sometimes the fermented juice separated from the husks is also employed.

The following data will give an idea of the dimensions of the industry: in 1890 the Erivan distillery yielded about 127,000° of cognac, and the Tiflis distillery about 100,000° in the same year; besides this, the cellars of the Tiflis distillery contain a rather considerable store of grape spirit transported from other localities, which is kept until it becomes converted into cognac. The two distilleries at Agdam yielded during the autumn and winter of 1891 altogether 70,563° of cognac, of strength from 53 to 77 per cent.

In Bessarabia the cognac industry has only been started at two distilleries, one of which belongs to Mr. Tamoultz, a landowner, and the other to Mr. Reidell, a merchant from Kishinev. At both these works the distillation of the spirit is carried on in perfected steam stills, one of which at Reidell's distillery is after the Egro system, and the best grape spirit, sometimes redistilled, is chosen for the preparation of the cognac. However, the production is not particularly great, especially at Tamoultz distillery which, out of a total of 1,773,168° of grape spirit distilled between 1888 and 1891, only converted 15,520° into cognac; while at Reidell's distillery only 157,500° were converted into cognac out of 258,910° distilled in 1890 and 1891. Such an inconsiderable yield and sale clearly show that the industry is still in its experimental stage, as the wine merchants have not yet become acquainted with the article.

In the Crimea the first trials in the preparation of cognac date from the seventies, but the production was so small at that time, that the product was very little known, and did not fetch more than 1 rouble 20 kopecks per bottle. The trials made on the estates of Prince Vorontsov, and now the property of the Imperial Appanage, deserve more serious attention. At first the spirit for this purpose was distilled in simple furnace stills, and the materials, that is, husks, lees and wine, were mixed together; hence the product had the unpleasant smell and taste proceeding from the husks burnt at the bottom of the still, and its purification was extremely difficult, so that this cognac ceded to the lower qualities of French cognac. Subsequently, after the publication in 1884 of the regulations respecting the grape spirit industry, the young cognac industry was temporarily put to an end, because owing to the high price of the local wines, and the cost of labour and fuel, it was found to be unprofitable. Therefore the wine growers, who possessed perfected stills, ceased distilling spirit in them, and in order to utilize the refuse obtained in the

preparation of wine, they employed simple stills of the required capacity, that is, not over 30 vedros; and up to now they only distill spirit by this method, and sometimes sell the surplus in the form of a grape vodka, which is sold at the same price as the corn spirits. Thus the production of Russian cognac in the Crimea may be said to have only existed in its infancy, and the production of grape vodka is so small that it has no serious importance in the economy of the district.

Recently, in 1892, the erection of a works for the preparation of cognac from Russian grape wines was begun on the south coast of the Crimea, at Magarach on the estate of Mr. Zhouravlev. This enterprise was the idea of French cognac makers, and wine from Bessarabia was procured to start the works, which were opened in April 1892. The distillery plant consists of two furnace stills of a somewhat perfected construction. The works are managed by a Frenchman having great experience in the preparation of cognac in France. It is too soon to say anything about the possible results of this enterprise. At Warsaw also a distillery has recently been started under the name of «Imperial», for the production of Russian cognac. This firm obtains spirit from the Caucasus, and according to its quality either converts it direct into cognac by filtration, clarification, and mixing it with sugar, or else dilutes the spirit with water, and subjects it to a redistillation and then converts the distillate into cognac, or by diluting it with water, and adding a syrup of sugar or sweet wine, and keeping it in oaken casks. The price of the cognac from the «Imperial» distillery varies between 1 rouble 30 kopecks to 4 roubles a bottle according to its quality. In 1891 to 1892 this firm produced about 147,000° of cognac.

### THE PRODUCTION OF YEAST.

The spirit industry is somewhat closely connected with the production of compressed yeast. In some works, known as «yeast distilleries», the preparation of yeast is the chief object, and the spirit obtained from the wort forms a by-product. Besides these distilleries, there are also special works for the production of pressed yeast. The following table gives an idea of the development of the yeast industry since the institution of a tax upon pressed yeast in 1886.

| YEARS.          | YEAST DISTILLERIES.     |                                | YEAST WORKS WITHOUT SPIRIT DISTILLATION. |                                |                  | WORKS FOR TREATING LIQUID BEER YEAST. |                                   | TOTAL.<br>Production of yeast in pounds. |
|-----------------|-------------------------|--------------------------------|--|--------------------------------|------------------|---------------------------------------|-----------------------------------|--|
|                 | Number of distilleries. | Production of yeast in pounds. | Number of works.                         | Production of yeast in pounds. | Number of works. | Production of yeast in pounds.        | Number of distilleries and works. |  |
| 1886—1887 . . . | 55                      | 10,620,516                     | 89                                       | 799,988                        | 5                | 55,670                                | 147                               | 11,474,074                               |
| 1887—1888 . . . | 50                      | 13,937,371                     | 65                                       | 762,684                        | 3                | 43,944                                | 118                               | 14,743,999                               |
| 1888—1889 . . . | 45                      | 14,723,618                     | 58                                       | 708,551                        | 3                | 70,525                                | 106                               | 15,502,694                               |
| 1889—1890 . . . | 47                      | 15,291,747                     | 45                                       | 590,068                        | 3                | 73,400                                | 95                                | 15,955,215                               |
| 1890—1891 . . . | 49                      | 16,208,722                     | 35                                       | 486,410                        | 3                | 52,312                                | 87                                | 16,747,444                               |

These figures show that, notwithstanding the decrease in the number of works producing yeast, the production increases year by year. This increase must be almost exclusively ascribed to the development of the production of the yeast distilleries, where the yield of compressed yeast increases and makes considerable strides every year. At the works specially occupied in the manufacture of yeast, on the contrary, the production gradually decreases, while at those treating liquid beer yeast it rises and falls, although inconsiderably.

During 1890 to 1891, as has already been mentioned in speaking of the spirit industry, there were 49 yeast distilleries in Russia, instead of 47 as in the preceding year. These distilleries altogether treated 3,053,556 pounds (49,235 tons), of corn stuffs, instead of 2,815,030 pounds (45,390 tons) in 1889 to 1890; including 2,078,608 pounds (33,515 tons) of rye flour, 712,756 pounds (11,492.3 tons) of dry malt, 225,616 pounds (3,638 tons) of maize, 35,312 pounds (569.4 tons) of green malt, 1,264 pounds (20.3 tons) of wheat flour, and 177 pounds (2.3 tons) of liquid beer yeast. Altogether 16,208,722 pounds (14,633,234 English lbs.) of compressed yeast was produced.

The yeast distilleries predominate in the north-western governments, where in 1890 to 1891 there were 18, that is, 36.8 per cent of the total number in the Empire; then come the eastern governments with 8 distilleries, the south-western and central Chernoziom governments with 5 distilleries each, the Baltic governments and Poland with 4 distilleries each, the central manufacturing with 3 distilleries, and the northern and Little Russia with 1 distillery each. The production of compressed yeast is chiefly concentrated in the western zone, namely, in the north-western, south-western, Baltic governments, and Poland, where in 1890 to 1891 31 works, or 61.4 per cent of the total number, produced 11,355,840 pounds (10,252,052 English lbs.), that is, 70.1 per cent of the total production of all the yeast distilleries in the Empire. The largest average production per distillery, however, is not in the western zone but in the central manufacturing region, where it amounted to 1,051,649 pounds per distillery; while in the governments of the western zone it varied between 238,250 and 670,337 pounds (215,074 and 605,180 English lbs.) per distillery.

In 1890 to 1891 there were altogether 35 works for the preparation of compressed yeast without the distillation of spirit, or 10 less than in 1889 to 1890. Owing to so considerable a decrease in the number of yeast works, and in their average output, the production of compressed yeast itself has also diminished.

During the year 1890-91, stores amounting to 79,001 pounds, or 1,273.8 tons, were employed in the above-mentioned works, from which were prepared 486,410 pounds, or 429,130 English pounds, of dry yeast, in place of 590,068 pounds, or 532,713 English pounds, the quantity prepared during the year 1889-90.

The non-distilling yeast establishments are, on the contrary, to be found mostly in the southern and eastern parts of the Empire, especially in the central black-soil zones, where there are ten, whilst in the southern governments there are but seven, and in the eastern, only six. By the manufactories of these three tracts 360,788 pounds of yeast were produced, that is, more than 74 per cent of the entire quantity produced by non-distilling works. The produce of one non-distilling yeast establishment varies from 5,349 to 19,389 pounds, the average quantity amounting to 13,879 pounds, or 12,546 English pounds.

There are in all not more than three dry yeast breweries, two in the Warsaw, and one in the Kovensk government, These establishments employ 7,910 vedros, or

25,707<sup>1</sup>/<sub>2</sub> gallons of wet beer yeast, from which are produced 52,312 pounds, or 47,228 English pounds, of dry yeast: that is, in each establishment, 17,437 pounds, or 15,742 English pounds.

The principal materials employed in the production of dry yeast in the chief brandy distilleries are rye flour (68.1 per cent) and dry malt (23.3 per cent); in addition to which as much as 7.4 per cent of maize flour, about 1 per cent of green malt, and a small quantity (0.02 per cent) of wheat flour, are employed. For the most part, the same materials are used in non-distilling yeast works. Thus, they use 87.3 per cent of rye flour, 10.3 per cent of dry malt, 1.9 per cent of maize flour, and about 0.5 per cent of barley flour. The average product of dry yeast from a pound of mash amounts to 5.31 pounds in the yeast distilleries, and to 6.16 pounds per pound in the non-distilling yeast establishments.

According to the tariff actually in force, a duty of ten kopecks per pound is laid on dry yeast, which tax is levied on the band-roll of each packet of yeast. These packets are of two kinds; pound packets, and quarter pound packets. The whole quantity of yeast produced in 1890-1891 by all the yeast distilleries, the non-distilling yeast works, and the manufactories of dry beer yeast, amounted to 16,747,444 pounds, or 15,119,592 English pounds; making in all 11,486,046 pound packets and 21,037,593 quarter pound packets, weighing altogether 5,259,398 pounds.

## BEER AND MEAD BREWING.

As far as the use and production of beer are concerned, beer brewing does not occupy in Russia such an important place as brandy distilling. For this reason, the Crown revenue raised from beer brewing, in the way of excise duties and license taxes, amounts to the comparatively modest sum of 5,225,000 to 5,500,000 roubles; whereas brandy distilling, including the manufacture and sale of spirituous liquors, brings in from 250,000,000 to 255,000,000 roubles.

At the same time, it must not be forgotten that, from the earliest period down to the present day, beer brewing has been carried on not only in breweries but also in private houses. Home brewing of beer is largely developed among the peasants; on the principal holidays, church festivals, or at weddings and other festivities, the peasants are accustomed to brew large quantities of beer, exclusively for home consumption, and not for the trade. Beer brewed at home is free from all taxes, and it is, therefore, impossible to give the exact quantity per annum; but there is every reason to suppose that so far from it being less, it considerably exceeds the quantity prepared in breweries.

The production of kvas, the ordinary drink of the Russian people, is carried on to a still larger extent. The difference in preparing beer and kvas mainly consists in this, that the mash for kvas is made chiefly from rye malt, is not boiled with hops, which would prevent lactic fermentation; and hence the mash for kvas undergoes a double fermentation, one acetic and the other lactic. The kvas thus obtained will be found to contain very little alcohol, and to have a refreshing, sourish taste, owing to the presence not only of carbonic but also of lactic acid. In every part of Russia kvas is brewed in private houses, in many of the large towns, and in small breweries especially devoted to its production. Kvas is not subject to

any excise duty. The total quantity of home-brewed beer and kvas, as well as the quantity of grain used in their production, exceed by many times the quantity of beer and mead made in the breweries.

The excise returns show that the largest quantity of beer was brewed in the year 1882, when the duties amounted to 5,807,380 roubles, or 2,988,478 dollars; but the revenue from beer brewing, in consequence of the general commercial stagnation which obtained from the year 1883 till 1887, was reduced by nearly a million roubles, and it is only since the year 1888 that the revenue has recovered a little, though it has never attained to the amount it reached in the year 1882.

In 1891 there were at work in all Russia 1,811 breweries, 52 less than in the preceding year. Such a decrease in the production of beer was shown, not only in the diminution of breweries but in the fall of the excise revenue, which in 1890 amounted to 5,268,758 roubles, or 2,711,303 dollars, whereas in 1891 it amounted only to 5,118,221 roubles, or 2,633,836 dollars. This decrease is to be explained, partly by the bad harvest in the year 1891, and partly by the production of beer being monopolized by a few large breweries. The excise duty on beer up to the 1st of December, 1892, was levied at the rate of 20 kopecks per vedro (a vedro is equal to 2.70 gallons) from each mash vat. From and after that date the duty was raised to thirty kopecks. In fact, during a period of ten years, from 1880 to 1890, the average product of a brewery amounted to 21,060 vedros, or 68,445 gallons; but in 1890 it increased to 25,587 vedros, or 83,158 gallons, whilst in the following year 1891, it further rose to 25,952 vedros, or 84,344 gallons.

The above-mentioned 1,181 breweries are distributed over the districts of Russia according to the following table:

| GOVERNMENTS.                            | BREWERIES. | PER CENT OF<br>WHOLE NUMBER<br>OF BREWERIES. |
|---|------------|--|
| Poland . . . . .                        | 249        | 21.08  |
| Baltic . . . . .                        | 240        | 20.32  |
| North-western . . . . .                 | 215        | 18.20  |
| South-western . . . . .                 | 80         | 6.77   |
| Southern . . . . .                      | 91         | 7.70   |
| Central Chernoziom . . . . .            | 51         | 4.31   |
| Siberian, including Turkestan . . . . . | 71         | 6.01   |
| Eastern . . . . .                       | 43         | 3.64   |
| Little Russia . . . . .                 | 47         | 4.00   |
| Central manufacturing . . . . .         | 34         | 2.88   |
| Northern . . . . .                      | 23         | 1.95   |
| The capitals . . . . .                  | 17         | 1.44   |
| Transcaucasian . . . . .                | 20         | 1.70   |
| Total . . . . .                         | 1181       | 100  |

If the whole of European Russia be divided into two tracts, the western and the eastern, seventy per cent of the beer breweries will be found in the first tract, notwithstanding that it is made up of a smaller number of governments, and only thirty per cent in the second; the beer produced is divided in the same ratio. By the official excise returns, and by fixing the average duty, in accordance with observation and calculations, at 16.7 kopecks per vedro, the conclusion is reached that the entire quantity of beer brewed in the year 1891 may be reckoned at 3,648,030 vedros, or 99,616,097 gallons, instead of 32,211,239 vedros, or 104,686,527 gallons, the quantity for the year 1890. The following table of the excise duty, paid at the average rate of 16.7 kopecks per vedro, and the quantity of beer brewed in each of these districts, has been drawn up for the purpose of acquainting the reader with the distribution of this product over the different districts.

| GOVERNMENTS.                          | DUTY PAID. | QUANTITY OF BEER BREWED. |            |
|---------------------------------------|------------|--------------------------|------------|
|                                       | Roubles.   | Vedros.                  | Gallons.   |
| Poland . . . . .                      | 1,097,821  | 6,573,778                | 21,364,778 |
| The capitals . . . . .                | 1,068,310  | 6,397,066                | 20,790,465 |
| Baltic . . . . .                      | 894,892    | 5,358,634                | 17,415,560 |
| North-western. . . . .                | 546,992    | 3,275,400                | 10,645,050 |
| Southern . . . . .                    | 431,728    | 2,585,200                | 8,401,900  |
| South-western. . . . .                | 218,286    | 1,307,100                | 4,248,075  |
| Central manufacturing . . . . .       | 192,978    | 1,155,556                | 3,755,557  |
| Eastern . . . . .                     | 172,275    | 1,031,586                | 3,352,658  |
| Central Chernoziom . . . . .          | 129,337    | 774,473                  | 2,517,037  |
| Little Russia . . . . .               | 110,512    | 661,747                  | 2,150,678  |
| Northern . . . . .                    | 93,853     | 562,000                  | 1,826,500  |
| Siberian, including Turkestan . . . . | 93,796     | 561,652                  | 1,825,369  |
| Transcaucasian . . . . .              | 67,444     | 403,838                  | 1,312,470  |
| Total . . . . .                       | 5,118,224  | 30,648,030 *             | 99,606,097 |

Thus it is seen that, in the western tract, where the largest number of breweries is to be found, 54 per cent of the beer brewed in European Russia is produced; and this percentage will be considerably increased, if in this tract the Petersburg government be included. The Baltic and Polish districts and the capitals form the centres of this industry, such as Riga, Warsaw, Petersburg, and also Moscow. The large breweries are the chief suppliers of the beer market, and are able to hold their own against any local provincial competition. The quantity of beer produced depends for the most part, not so much on the size or extent of the brewery, as on the num-

\* As may be seen from this table, the quantity of beer, excluding home-brewed, and reckoning the population of Russia at 120,000,000 inhabitants, consumed annually per head amounts to about 1/4 vedro, less than is consumed in most of the European states.



ber of breweries in one or another of the tracts. Taking the average extent, the product of each brewery in a tract is found to be distributed according to a scale quite different to what would be the result if the total quantity of beer brewed were taken. In the returns for the year 1891, they are arranged in the following order.

| GOVERNMENTS.                          | DUTY PAID,<br>BY BREWERIES. | QUANTITY OF BEER BREWED. |           |
|---------------------------------------|-----------------------------|--------------------------|-----------|
|                                       | Roubles.                    | Vedros.                  | Gallons.  |
| The capitals . . . . .                | 62,841                      | 376,293                  | 1,222,952 |
| Central manufacturing . . . . .       | 5,675                       | 34,000                   | 110,500   |
| Southern . . . . .                    | 4,744                       | 28,407                   | 92,323    |
| Poland . . . . .                      | 4,408                       | 26,400                   | 85,800    |
| Northern . . . . .                    | 4,080                       | 24,431                   | 79,400    |
| Eastern . . . . .                     | 4,006                       | 24,000                   | 78,000    |
| Baltic . . . . .                      | 3,728                       | 22,323                   | 72,550    |
| Transcaucasian . . . . .              | 3,372                       | 20,191                   | 65,621    |
| South-western . . . . .               | 2,728                       | 16,335                   | 53,089    |
| North-western . . . . .               | 2,544                       | 15,234                   | 49,510    |
| Central Chernoziom . . . . .          | 2,487                       | 14,892                   | 48,399    |
| Little Russia . . . . .               | 2,360                       | 14,131                   | 45,726    |
| Siberian, including Turkestan . . . . | 1,321                       | 8,000                    | 26,000    |

The Petersburg and Moscow governments form the most striking exception, where, in spite of the small number of breweries, seventeen in all, a very large quantity of beer is produced; and consequently, in respect to the total quantity of beer brewed, these two governments occupy a prominent place.

The chief and principal material, barley, used in brewing beer, is all of Russian growth. The best sort of barley comes from the Polish, western, south-western, and Baltic governments. The barley grown in the Saratov and Tsaritsin governments is also much sought after.

The second important material employed in Russian breweries, hops, is partly imported, chiefly from Bohemia and Bavaria, and partly of Russian growth, the Volynian being preferred. The difference in price of Volynian and foreign hops varies from three to twenty-five roubles per pound; but so-called local hops are sold from fifteen to twenty per cent cheaper than hops of foreign growth. At the present time Volynian hops are gradually forcing foreign imported hops out of the market. Thus, for example, in the principal breweries of the Samara government, till a quite recent period, foreign hops were exclusively used; whilst in 1890 a very small quantity of them was imported, to mix with home-grown hops, bought for the most part in the Volynian and Podolsk markets. The same thing is noticed in the government of Kovno, where Volynian hops, thanks to the yearly improvement in their quality, are preferred to the foreign; the latter, even in the best breweries and for the production of beer of the highest quality, being mixed with home-grown hops in the pro-

portion of about 30 per cent. There are good reasons for believing that very often in the Empire, Russian hops are sold and passed off for those of foreign growth. Some of the breweries have already begun to have their own hop plantations. Among such may be mentioned the Oukrainka brewery in the Kharkov government. But there are breweries in the Volynian government that use only wild hops.

According to the sorts of beer produced in the Russian breweries, malt grinding and mash clearing are effected by different processes: by decoction (Bavarian), by infusion (English), or sometimes by a slightly varied application of these two principal methods.

The kinds of beer made in Russia may be classified under three principal groups. Firstly, the best sorts: porter, export, bock beer, Munich beer, Vienna beer, et cetera; secondly, Bavarian beer; thirdly, simple or half-beer. From a poud of ground malt are produced on an average about 4.9 vedros of beer of different qualities, or from 100 English pounds of malt, 44.3 gallons. In the St. Petersburg breweries the product of a poud of malt amounts from two to three vedros of porter and export of the finest quality; elsewhere, as in the Chernoziom, north-western, and Little Russia governments, from 2.7 to 3.5 vedros are produced, and in the Baltic governments, where the mash is thin, as much as 4 vedros. In consequence of this difference in produce, the amount of the duty levied per vedro of beer varies considerably, ranging from 16¼ to 31 kopecks, and in the St. Petersburg breweries, from 32 to 38 kopecks per vedro. The Bavarian beer gives nearly everywhere the same result, about 4.5 vedros, the only exceptions being, first, the Baltic and north-western governments, where a weak mash is produced, with a result of 5.2 vedros; and secondly, the Chernoziom governments, where on the contrary a very thick mash is produced, giving in all about 3.7 vedros of beer. Conformably to this, there does not seem to be any great variation in the proportion of the duty levied per vedro, which in general amounts to about 20¼ kopecks. In the production of common beer great variations in both respects are to be noticed. In the central, eastern, and in some of the Little Russia governments, with a result of 3.7 vedros, a duty of from 31 to 24 kopecks is levied per vedro; whilst in the Baltic governments, with a result of 10 vedros, the duty does not amount to more than 13.3 kopecks; in the Polish governments, with a result of 6.7 vedros, the duty comes to 10.7 kopecks; and in the north-western governments, with a result of 6.6 vedros, the duty is 12.6 kopecks.

Though not so intimately connected with rural and farming economy as brandy distilling, the production of beer is none the less the source and cause of sale of many farming and country products, and contributes greatly to the development of one particular branch of rural economy, the growth of hops. Hop cultivation becomes a matter of considerable importance, in as much as with every improvement in the culture and dressing of hops, the breweries are freed, if not altogether, at least to a large extent, from the necessity of being supplied with this valuable product by foreign markets.

In distinction from beer brewing, the brewing of mead is gradually falling off. There were in all Russia, in 1891, 526 mead breweries at work, and of these only 219 were specially devoted to the production of mead, the remaining 307 forming but branches of beer breweries. All these establishments were distributed over the different governments of the Empire according to the following tabular return:

| GOVERNMENTS.                           | NUMBER OF BREWERIES. |                    | TOTAL. |
|--|----------------------|--------------------|--------|
|  | For mead.            | For mead and beer. |        |
| Poland . . . . .                       | 76                   | —                  | 76     |
| Baltic . . . . .                       | 18                   | 78                 | 96     |
| North-western . . . . .                | 70                   | 5                  | 75     |
| South-western . . . . .                | 26                   | 11                 | 37     |
| Southern . . . . .                     | 6                    | 31                 | 37     |
| Central Chernoziom . . . . .           | 6                    | 34                 | 40     |
| Siberian, including Turkestan. . . . . | —                    | 19                 | 19     |
| Eastern . . . . .                      | 1                    | 30                 | 31     |
| Little Russia . . . . .                | 6                    | 31                 | 37     |
| Central manufacturing . . . . .        | 3                    | 29                 | 32     |
| Northern. . . . .                      | —                    | 22                 | 22     |
| The capitals . . . . .                 | 7                    | 15                 | 22     |
| Transcaucasian . . . . .               | —                    | 2                  | 2      |
| Total. . . . .                         | 219                  | 307                | 526    |

The average amount of duty paid by these mead breweries is excessively small. Thus, in 1891, the duty paid by all these 526 breweries amounted to 22,128 roubles, giving for each brewery the average sum of 42 roubles; and this in the preceding year, 1890, was still less, being only 39.5 roubles. But it must not be forgotten that the amount paid by the different breweries varies to a considerable extent, in some places greatly exceeding, and in other places falling below, as much as one half or even more, the normal sum. In the Petersburg and Moscow governments the average rate of duty paid may be reckoned at 162.27 roubles; in the north-western, not more than 31.85 roubles; and in the central manufacturing districts still less, 30.37 roubles. What an unimportant place these mead breweries occupy among the industrial establishments of Russia is further shown by the fact that in the greater number of them, especially those forming mere branches of beer breweries, nothing more than small vats for mead brewing are found; whilst in many of them there will not be more than one or two brews in the course of the whole year. The special mead breweries are for the most part located in the Polish and north-western governments, where there are altogether 146, that is, 67 per cent of the whole number in all Russia. The mead branches of beer breweries are chiefly concentrated in the Baltic governments, where there are 25, that is, 4 per cent of the whole number, and in the central Chernoziom, Little Russia, eastern, and central manufacturing districts.

The principal material used in brewing mead is not honey, but sugar, seasoned with different sweet spices. It is only in some of the breweries of the western and Polish governments that pure honey is employed.



## CHAPTER XIX.

## Tobacco Industry.

THE manufacture of tobacco goods is one of the industries, the products of which are in Russia liable to excise duties. This duty is levied by means of band-rolls, of which there are two classes: the higher band-rolls used for all superior sorts of tobacco goods, and the lower band-rolls for *makhorka* and other less expensive kinds of tobacco products. During the period of five years, 1881 to 1885, there were 345 tobacco manufactories in all Russia; during the following five years, from 1886 to 1890 there were 343, and in the year 1891 there were 323. Of the 323 manufactories which were at work in 1891, 187, or 58 per cent of the whole number, produced tobacco goods of the higher quality, and 136, or 42 per cent, *makhorka* and tobacco goods of an inferior quality. Moreover, to 54 establishments of the prime class were attached branches for the preparation of cheaper and inferior tobacco goods. The total quantity of products prepared by all these tobacco manufactories in the course of the year 1891 amounted to 3,539,500 pounds, of which 944,500 pounds were given out under higher band-rolls and 2,594,800 pounds under the lower.

In the preparation of goods of both kinds, tobacco of Russian growth was principally employed. Thus, in the year 1891, not more than 1.6 per cent of the tobacco used in the Russian manufactories was imported. The use of foreign tobacco is thus limited, not only in consequence of the heavy duty laid upon it, but because in the present day there is no lack in Russia itself of raw material of the very finest quality. Such can easily be obtained from the Crimea, Bessarabia, and the Caucasus. In the manufacture of the higher kinds of tobacco goods, the sorts of Russian tobacco most in use are, the Trebisond, the Samson, and the South Coast, from the Crimea. Formerly, Bessarabian tobacco was in great demand, but it has gradually lost the preference it once enjoyed, from the time that culture of tobacco became so widely developed in the northern districts of the Caucasus.

The development of the manufacture of tobacco goods, the excellency of which depends, to a much larger extent than is the case with any other branch of com-

mercial industry, on the quality of the raw material employed, is but slightly aided or promoted by the progress of mere technical knowledge. The manufacturer of tobacco products has mainly to take care that the raw material supplied to him be well and properly sorted, and that any damage it may have incurred whilst in store be made good.

Although in Russia cigarettes, or *papirosi* as they are always called, are in much greater use than either pipes or cigars, tobacco nevertheless forms the main article of manufacture, since most smokers prefer to prepare their *papirosi* at home for themselves, and for this purpose employ ready made cigarette-paper rolls or cases. The tobacco products prepared during the year 1891 in all the manufactories, and given out under the higher band-rolls may be classified in the five following groups:

|  |                 |
|--|-----------------|
| Tobacco 1st, 2nd, 3rd quality . . . . .    | 714,300 pounds  |
| Snuff . . . . .                            | 700 »           |
| Cigars 1st, 2nd, 3rd quality . . . . .     | 65,300 »        |
| Cigarettes 1st, 2nd, 3rd quality . . . . . | 163,400 »       |
| Small cigars . . . . .                     | 800 »           |
| Total . . . . .                            | 944,500 pounds. |

The quantity of *makhorka*, and other inferior tobacco products, given out under the lower band-rolls, amounted in 1891 to 2,594,800 pounds. Of this total quantity 2,068,200 pounds were employed for the manufacture and preparation of smoking *makhorka*, 284,100 pounds for snuff *makhorka*, and 240,300 pounds for dry *makhorka*. The enormous preponderance of *makhorka* over all other tobacco products may easily be explained by the wide and general use of this kind of tobacco among the peasant classes of the country.

The more active centres of tobacco manufacture in Russia are not to be found, as might be expected, in the main central tracts of its produce and culture. Thus, the Chernigov and northern Caucasian districts form the chief Russian tobacco plantations, but they occupy a very low rank among the tobacco manufacturing districts of Russia. In other governments, which hold a high place among the tobacco-growing tracts of Russia, is noticed also the same disparity, if their tobacco industries be compared with those of the Petersburg, Moscow, Warsaw, Lithuanian, Kiev, and Yaroslavl governments, or the Don provinces. In general, the manufacture of tobacco has become domiciled and greatly developed in those places where other manufacturing industries have attained considerable dimensions. At the same time it is necessary to remark that it is by no means distinguished by the same traits in the different tracts. In some places, *makhorka* products alone are prepared on an extensive scale, whilst frequently in the neighbouring districts only cigars are manufactured in large quantities, and elsewhere is found tobacco of the finer qualities, and *papirosi* forming the staple article of production. In only a few of the more central cities, such as St. Petersburg, Moscow, Warsaw and Riga, are tobacco products of all kinds manufactured, since these goods are prepared for a large and varied circle of both local and provincial smokers, whose different tastes and demands have consequently to be satisfied and supplied.

The central manufacturing governments occupy the first place in the tobacco industry. In these governments, 56,100 pounds of tobacco goods were in 1891 prepared and sent out under the higher band-rolls, and 708,800 pounds under the lower band-rolls. The quantity of each particular sort of tobacco goods there manufactured is set forth in the following table:

1. Goods issued under the higher band-rolls:

|                         |               |
|-------------------------|---------------|
| Tobacco . . . . .       | 36,200 pounds |
| Snuff . . . . .         | 500 >         |
| Cigars . . . . .        | 2,800 >       |
| Cigarettes . . . . .    | 16,500 >      |
| Little cigars . . . . . | 100 >         |

2. Goods issued under the lower band-rolls:

|                            |                |
|----------------------------|----------------|
| Makhorka tobacco . . . . . | 576,100 pounds |
| Makhorka snuffs . . . . .  | 111,200 >      |
| Dried makhorka . . . . .   | 21,400 >       |

As may be seen from the above returns, the tobacco industry of the central manufacturing governments is dependent on the extent to which it meets the demands and tastes of the humbler classes. For this reason, there is a large manufacture of tobacco of inferior qualities, particularly *makhorka* and *makhorka* snuff, chiefly in the Yaroslav government, whilst the manufacture of cigars is limited, and the preparation of tobacco for *papirosi* is by no means large. It may be added that only in the Moscow government are all these kinds of tobacco goods alike manufactured.

So far as the various kinds of tobacco products are concerned, there is but little difference to be noticed between the central manufacturing governments and the central Chernoziom, the Little Russian, the south-western and the eastern governments. The principal point of difference is that in the latter, cigars are not manufactured at all. An idea of the extent and distribution of this industry over all these four governments may be formed from the following table:

|  | Central Chernoziom. | Little Russia. | South-western. | Eastern.   |
|--|---------------------|----------------|----------------|------------|
| 1. Tobacco . . . . .                     | 4,500               | 51,000         | 88,300         | 900 pounds |
| Cigarettes, or <i>papirosi</i> . . . . . | 1,100               | 4,400          | 6,200          | 700 >      |
| 2. Makhorka tobacco . . . . .            | 536,400             | 317,900        | 110,000        | 98,200 >   |
| Makhorka snuff . . . . .                 | 37,800              | 35,200         | 9,500          | 100 >      |
| Dried makhorka . . . . .                 | 8,500               | 10,000         | 3,300          | 43,300 >   |

In all these four governments, the staple article of tobacco manufacture is *makhorka*, and this is much developed in the central Chernoziom, and in the Little Russia governments.

The manufacture of *makhorka* goods has also the preeminence over all other tobacco products in the north-western and Baltic governments, as well as in the dis-

tricts on the Vistula. But in all these places the influence of Western European tastes is felt; for together with *makhorka* goods a considerable number of cigars is manufactured, especially in the Vistula districts, whilst the manufacture of tobacco and cigarettes is more limited, particularly in the last two provinces. Thus, in 1891 were prepared:

|  | North-western. | Baltic. | Vistula.      |
|--|----------------|---------|---------------|
| 1. Tobacco . . . . .                     | 13,600         | 9,100   | 10,800 pounds |
| Cigars . . . . .                         | 12,300         | 15,100  | 24,900 »      |
| Cigarettes, or <i>papirosi</i> . . . . . | 13,200         | 700     | 6,600 »       |
| 2. Makhorka tobacco . . . . .            | 285,400        | 39,500  | 71,000 »      |
| Makhorka snuff . . . . .                 | 37,900         | 800     | 5,100 »       |
| Dried Makhorka . . . . .                 | 72,900         | 63,800  | 2,800 »       |

It is quite different with the southern and Transcaucasian districts, where the manufacture of superior tobacco goods, issued under the higher band-rolls, assumes considerable proportions, coupled with a complete absence, so far as the southern districts are concerned, of the manufacture of cigars. According to the returns for 1891, the manufacture of tobacco products was thus distributed in these places:

|  | Southern districts. | Transcaucasian districts. |
|--|---------------------|---------------------------|
| 1. Tobacco . . . . .                     | 268,300             | 45,000 pounds             |
| Cigars . . . . .                         | —                   | 100 »                     |
| Cigarettes, or <i>papirosi</i> . . . . . | 26,000              | 12,300 »                  |
| 2. Makhorka tobacco . . . . .            | 15,500              | 6,600 »                   |
| Makhorka snuff . . . . .                 | 300                 | —                         |
| Dried Makhorka . . . . .                 | 3,800               | 800 »                     |

In both these districts the manufacture and preparation of *makhorka* goods occupy a prominent place among the local industries. The manufacture of the finer kinds of tobacco is mainly concentrated in Rostov-on-Don, where there are numerous extensive manufactories that have long acquired a solid reputation for the high quality of their goods.

In the northern districts, including the Petersburg government, tobacco goods of the finer qualities, and issued under the higher band-rolls, are also more largely manufactured than tobacco goods of the lower and inferior sorts. But it is to be noticed that at the same time a greater percentage of cigarettes and also cigars is produced in these districts than is the case in the southern governments. Thus, in the year 1891 were manufactured:

| 1.  | 2.                            |
|---|-------------------------------|
| Tobacco . . . . . 183,300 pounds                  | Makhorka tobacco 9,400 pounds |
| Cigars . . . . . 10,200 »                         | Makhorka snuff . 50 »         |
| Cigarettes, or <i>papirosi</i> . . . . . 75,400 » | Dried makhorka . 9,800 »      |

The principal Russian tobacco manufacturers, Bogdanov and Company, have their works at St. Petersburg, and in the year 1891 paid on their band-rolls 2,000,000 roubles.

Only a small proportion of tobacco goods of the finer qualities is imported into Russia; the demand is gradually falling off, and as Russian tobacco manufactures are now generally valued for their cheapness and good quality, they are each year commanding a larger export. The following table will be found to give all the necessary data as to the exportation and importation of tobacco goods for the years 1883 to 1886, and 1887 to 1890:

|                     | Tobacco.     | Cigars.        | Cigarettes.       |
|---------------------|--------------|----------------|-------------------|
| 1883—1886 imported: | 3,345 pounds | 2,367 pounds   | —                 |
| 1887—1890 »         | 3,857 »      | 1,553 »        | —                 |
| 1883—1886 exported: | 4,367 »      | 290,721 pieces | 18,205,000 pieces |
| 1887—1890 »         | 6,848 »      | 155,925 »      | 30,587,000 »      |

From the above returns it will be seen that the importation into Russia of tobacco has slightly increased, and that of cigars has decreased 34.4 per cent during the second period of four years; whilst the exportation of tobacco has increased 56.8 per cent, and the exportation of cigarettes 68 per cent; and it is only in cigars that a general falling off is remarked.





## CHAPTER XX.

## Food Products.

## GRAIN FLOUR AND GROATS.

**T**HE preparation of flour in Russia was for a long while strictly limited to local necessities, and was practised with the sole design of meeting the requirements of a small circle, or district. It was easy enough to satisfy the modest tastes and demands of the consumers of flour, chiefly of rye, and mills were in earlier days furnished and worked in a most primitive fashion. The grain was often ground without having been first cleaned, and was afterwards but seldom well sifted. The millstones were put into motion either by oxen, or still oftener by the simplest types of water and wind power. Even to the present day there are to be found many similar mills, and in some places flour is still prepared by means of hand millstones. Nor will this in any way excite astonishment, if the extent of the Russian Empire be taken into consideration, with its varying degrees of wealth and development, and the constant incorporation into it of new and uncultivated tracts, where its civilizing activity finds a new scope and sphere.

Concerning the progress and development of the grain-grinding industry, it must be remarked that no official data exist to supply the necessary materials for information. The primary articles of daily life are, with very few exceptions, in this country free from all direct taxation; there are no taxes on millstones, or on ground products, nor are there any taxes of that class, as is the case in many countries. There is consequently no urgent necessity for regular returns of such products. There are, therefore, either no returns at all, or such as there are, till within a very recent period, were made loosely and without accurate verification.

It is certain that the grinding trade first began to occupy a place of any importance among the commercial industries of Russia towards the end of the first quarter of the present century. It was then that American improvements in the construction of mills were introduced into this country; the first to make such improve-

ments being the well-known millwright, Oliver Evans. By the introduction of these mills, which were long known as American, the expense of grinding grain was considerably decreased, a smaller number of hands being employed, and the heavier part of the work being performed by machinery. This led to the construction of mills of greater power, and to a consequently increased commercial activity in the purchase of grain, and in the sale of flour.

Till the middle of the present century, the larger mills, with scarcely an exception, were worked by water, and were constructed near commercial and trade centres on the shores of the more important rivers, where it was easy to obtain grain and to transport flour. Both then and in earlier times, it is noticed the corn-grinding industry mainly flourished in the upper districts of the Volga and its affluents. These streams have, to the great advantage of Russian trade, been since united to the Baltic by means of canalization. In these upper districts of the Volga, from an early period, the trade and commerce of every kind took a firm root; and, though not a wheat-growing tract, these districts have long been the central markets of the wheaten flour industry, the grain being brought thither from the lower districts of the Volga.

With the introduction of steam machinery, and the enlargement of the chain of railways, mills of a larger size, and with greater working power, began to be built, chiefly for grinding wheat, both in the upper and in the lower districts of the Volga; they were also constructed along the lines of railroad running to Moscow and passing through the fertile regions of central Russia. A little later we find them in the governments lying on the Black Sea and on the Sea of Azov, near the port towns of those seas, as well as along the roads leading from the western zone of the black-soil tract to the Baltic Sea.

For some years the employment of steam as a motive power in the mills made slow advance, but later became more and more quickly adopted. According to some semi-official returns, published in 1887, of all the mills at work in European Russia up to the year 1845, there were only three worked by steam.

|  |     |
|--|-----|
| In the period of 4 years from 1846 to 1850 there was built | 1   |
| » » » » 1851 » 1855 » »                                    | 1   |
| » » » » 1856 » 1860 there were built                       | 11  |
| » » » » 1861 » 1865 » »                                    | 20  |
| » » » » 1866 » 1870 » »                                    | 25  |
| » » » » 1871 » 1875 » »                                    | 58  |
| » » » » 1876 » 1880 » »                                    | 68  |
| » » » » 1881 » 1885 » »                                    | 141 |

If the official reports of the actual condition of the corn-grinding industry in Russia be taken into consideration, there is every reason to conclude that the construction of mills worked by steam has been pushed forward with even more rapidity than is set forth in the above-cited table.

In general at the present day, the preparation of flour has begun to assume more and more the character of a manufacturing industry, and the manufacture of wheaten flour has in the last fifteen years become a highly important branch of

commerce. The rapid development of the flour trade is in close connection with the technical changes made at the same time in the grinding of grain by the introduction of rolling wheels, and numerous other improvements in mill machinery and apparatus, as well as in the construction of mills. It should be mentioned that the Russian millers, in proceeding to the construction of large steam rolling mills, not seldom with the automatic march of the grinding wheel, soon became convinced of the profit to be made out of such improvements, and gladly adopted them. Without seeking new markets for the sale of flour, they continued to increase the number of new mills, and to augment the productive power of those already existing. Between the years 1875 and 1880, millers brought on a commercial crisis by manufacturing in excess, and some were compelled to work less, whilst others became quite insolvent. The crisis was felt most acutely by some of the merchants who they had constructed mills, reckoning on obtaining easy credit; and credit, owing to certain circumstances connected with the administration of several of the private banks, could not be obtained except for very short terms and with great difficulty. Another unfavourable circumstance with which the new steam rolling mills had for a while to contend was that buyers, having become acquainted with the good qualities of wheaten flour, and the way in which it should be prepared, began to show complete indifference to wheaten flour of an inferior quality, which consequently remained unsold and accumulated from year to year.

These accidental circumstances have now ceased to have any influence; the supply is more carefully regulated by the demand, and wheaten flour prepared in the larger steam roller mills has opened up for itself new markets; the monetary crisis has passed; and the different kinds of flour are produced in measure with calculated profits of sale. As a rule, the production of wheaten flour is becoming more and more concentrated in the larger mills, the number of which is being constantly increased, not as before from an artificially forced activity, but with far more judgment and caution.

In proceeding to speak of the manufacture of flour, it may be remarked at the outset that it is chiefly prepared from rye and wheat. There are many different kinds of rye grown in Russia, and these are generally called after the particular place of their growth. The heavier sorts of rye (from 8 pounds 8 pounds to 9 pounds 25 pounds per chetvert, or from 49.70 to 56.48 English pounds per bushel) are mostly sent abroad, and the lighter sorts are used for making rye bread, which is so generally eaten throughout Russia.

Rye flour is in Russia generally prepared by simple grinding. The commonest sort, known under the name of *ordinary rye*, is obtained by one light grinding of the grain; and without any further preparation, but it is bolted, if it is sent off for sale. The middle sort of flour, called *peeled rye flour*, is obtained by the grinding of more carefully cleaned, peeled, and shelled grain, the hulls being sifted off, but the ground product is not sorted. The superior sort of flour, called *sifted rye flour*, is distinguished from the middle sort by the ground product of cleaned and shelled grain being subjected to careful sifting.

For grinding rye a set of upper and nether revolving stones is generally used, and a set of vertical mill wheels is seldom seen after the type of the Umfried wheels. The use of rollers for the grinding of rye is limited, being sometimes em-

ployed for the first grinding of sifted flour, in which case the rollers are smooth or furrowed, the subsequent grindings being made with smooth-surfaced millstones. For bolting, the ordinary sifting apparatus are employed, but in a few mills rotary sieves are met with.

In mills for the preparation of the finer sorts of rye flour about 80 per cent of the grain weight is secured, but in general a somewhat larger proportion of flour is obtained. The Russian people are so accustomed to black rye bread, that they prefer it to the white, not only because the latter is dearer, but because it lacks the peculiar taste and odour which the people affect, and of which, according to the common saying, «no man grows tired or can have too much of». As in estimating the quality of food products, the personal experience of the consumer must be regarded as the best guide, and by which the market demand and price are chiefly regulated, it must be confessed that there is no sufficient reason for employing any but the simplest modes of grinding rye, for procuring flour that shall be as free from bran as possible. But it is none the less necessary to develop the general use of sifted flour that shall not contain any large quantity of husk, in consequence of the necessarily bad quality of the bread made from such flour. An evidence of the kind of grinding most in use in Russia is seen by taking as an example the flour employed for the troops. The average quantity of bran sifted in a sieve of 400 meshes in each square inch amounts to 3.45 per cent, which gives about 10 pounds of bran for 290 pounds of flour.

In the flour trade and in the mill products two kinds of wheat are mostly used: the heavy (*triticum durum*), and the light *triticum vulgare*, but these groups represent many varieties, whose denomination has not as yet been definitely established. To hard wheat belongs first of all the *arnaoutka*, grown in the south, and frequently called *garnovka*; then follows the hybrid *arnaoutka* sown in the regions of the Volga, and called *bielotourka* if it comes from the sloping banks of the river, and *kubanka* when cultivated on the hillsides. Of the soft wheats, the first place must be assigned, in the south, to the *girka*; in the vicinity of the Volga, to the *russak*, or Russian wheat, and to the *saxonka* (saxon wheat); and in the western government, to the *sendomirka*. In trade each of these and other kinds of wheat are classified as high, medium, and low; which are further subdivided and either numbered, or designated by the names of their place of growth. The soft wheats are successfully exported, whilst Russian mills mostly grind a mixture of hard and soft wheats.

In the Empire, wheat flour has always been manufactured with great care, in order to obtain the highest quality, and as free from bran as possible. The Russian people are not very exacting with reference to rye flour, and put little value on its colour; but they are very particular as to the quality of wheat flour. In Russia the wheat is carefully cleaned and sorted before grinding. Russian millers pay particular attention to the separation of the kernel from the hull, and to the removal of the germs. Cleaning mills and hulling machines are often brought from America, especially the Howe hulling machines, although they are mostly used together with the local machine for hulling grain, and which consists of two hollow cones, the one fitting into the other; their working surfaces are covered with perforated iron sheets. The grain is passed between the surfaces during every rotation of the inner cone. The hulling is completed by sending the grain between two millstones at the proper

distance apart, and through a brush finishing machine, to obtain the remaining fragments of the hull. To prevent the pulverization of the hull and of the films that may still cling to the kernel outside or inside in the germinal furrows, it is slightly moistened before grinding. The part of the mill where all these operations are performed is generally separated from the rest of the building by a fire-proof wall; in some recently constructed mills, the separators and other machinery for the preparation of the grain for grinding are kept in different buildings, to insure them against danger from fire.

The usual method followed in Russia for making wheat flour consists in the preparation of groats, and their successive grinding into fine flour. In the first place the groats are separated from the meal dust, breaks and middlings, that always result from the process. The flour that falls off in this process is considered as the lowest quality, containing as it does a considerable amount of glume particles; however great the care taken to prevent their pulverization, it cannot be completely avoided. The breaks and middlings are separated from the bran, and sorted according to size and density by passing them through a strong aspirator. The highest quality of flour is obtained from the heavier and denser middlings and breaks, which are finely ground and passed over several purifiers. The medium quality flour is made from the lighter and non-friable middlings that come, not from the centre of the kernel but from near the surface, and which, according to the nature of the grain, are much darker than the central particles. The last reduction of the groats leaves behind the breaks of the hull, which being once more ground give the coarse and fine bran, as well as a very dark flour.

This method of grinding is since long ago practised in Russia, and is called *kroupchaty* or *kroupichaty* (made of groats) because the groats play a conspicuous part in this method of grinding. The mills which work according to this process are called *kroupchatki*. The production or working of groats, called *dranié* (peeling), in these mills often undergoes seven different processes. The newly constructed mills use for the work, sets of fluted rollers, the most popular of which are those with two pairs of rollers, the axes of which are disposed in one common horizontal plane. The sets of rollers from Genz's manufactory in Buda-Pest, with tempered cast iron rollers from Gruson's in Magdeburg, are those that enjoy the largest sale. When fluted rollers are substituted for common millstones the amount of flour-dust falling off by the reduction of middlings is diminished; in consequence a larger quantity of mealy particles is reduced to breaks and middlings, and a greater proportion of flour of high quality is obtained.

The groats are sifted by means of systems or groups of prismatic sieves; centrifugal sieves are seldom used; flat sieves, especially the Haggenmacher of Pest, are more often met with. Fanning mills for assorting and cleaning middlings are of different kinds. Amongst them are many American makes, especially the Smith purifier.

The grinding of purified breaks and middlings is done with ordinary millstones, or with smooth, sometimes even porcelain, rollers. These sets often consist of three rollers fixed one above the other (Mechwart and Daverio system); their combined work is the same as that of two pairs with axes disposed on the same plane. Sometimes sets of the latter system are used, especially the *Victoria*, with two porcelain rollers, patent of Wegmann in Zurich.

Sieves of the same type as those employed for groats are used for sifting breaks and middlings, but, of course, their meshes are different. Centrifugal sieves are also employed. The grinding of the residues from the last reduction of groats is done by passing them between ordinary millstones; they are sifted afterwards by means of the above-mentioned appliances. In Russia large and medium mills, *krouptchatki*, are five stories high; the smaller ones have only three or four stories. Many of them are lighted by electricity. On the Volga and its tributaries the mills have boilers heated with naphtha refuse; in the southern regions, coal is used as fuel. and in the northern, wood.

The work and the value of the production of Russian mills may be estimated by the successive amounts of the feed (*peredel*). In proportion to the power of the mill the feed amounts to 120, 1,200, and 2,000 pouds, or, in other numbers, to 72, 720, and 1,200 bushels.

In Russia the mills of the old system grind 9 sorts of flour, and 2 of bran. Such mills produce 40 per cent of the highest quality of flour, the so-called *kroupchatka*; this is sometimes subdivided into *confectionery* flour, *otymnaya*, and real *kroupchatka*. The second quality is called *pervach* and amounts to 28 per cent of the whole production; it is divided into *first pervach*, *drannaya* (peeled) and *second pervach*. The worst quality of flour (16 per cent) is called *koulichnaya*, subdivided into three sorts: *podroukavnaya*, *koulichnaya* and *mesheoumok*. Bran, coarse (*shapsha*), and fine (*messiatka*), forms 14 per cent; and loss, 2 per cent.

The mills of recent construction do not grind so many varieties of flour. Some of them cling to the old methods only to a certain extent; the greatest part of them introduce their own marks, figures, symbols, and brands. For instance, in some mills on the Volga the various kinds of flour are called: 1st quality, No. 0; 2nd quality, No. 00; 3d and 4th qualities, *pervach*; 5th quality, *drougach*; 6th quality, *vyboika*; others grade, as follows: 1A blue stamp, 1B red stamps, 2A blue stamp, 2B red stamp, 2C black stamp; 3d quality, 4th quality, and forage. The quoted examples do not by any means comprise all the existing brands; it must be admitted that Russian millers do not as yet possess a definite system of denomination and classification of their products. The table on page 354, which shows the percentage of flour of different sorts in the successive orders as they are issued from the separate mills, may give an idea of the quality of flour produced by Russian millers \*

The figures quoted in this table concern the mills that grind for the most part hard and soft wheats intermixed, such as *pererod* (hybrid of *arnaoutka*) with *russak*; of the soft wheat only one-quarter to one-third of the whole quantity of grain is taken. The mills of the last two columns are stated as giving only four sorts of flour; in reality the first and second qualities are subdivided, so that 6 grades are obtained. Some of the mills, as the table shows, produce a greater quantity of first grade flour than of the second, while others show the reverse. This fact may be explained by the demands of the local markets. The great percentage of bran given

---

\* The facts on which this table is founded have been taken from an essay of A. Klopov; «Description of the milling production in the region of the Volga (Povolzhie)», and from the data given by several millers.

for some of these mills, is due to the high prices thereof. The cost of the grinding, as declared by the millers, varies from 0.75 to 1.50 roubles paper per chetvert, or, approximately, from 25 to 50 cents per six American bushels. Although some of the proprietors reckon the cost of grinding higher, however, it may be estimated at an average price of 10 kopecks per pound of wheat, or 5 cents per 36 English pounds.

| S O R T S.           | PERCENTAGE OF FLOUR OF DIFFERENT QUALITIES AND BRAN PRODUCED<br>BY MILLS NEAR: |           |            |                  |        |         |           |          |        |         |
|----------------------|--|-----------|------------|------------------|--------|---------|-----------|----------|--------|---------|
|                      | Rybinsk.   | Yaroslav. | Koostroma. | Nishni-Novgorod. | Kazan. | Samara. | Orenburg. | Saratov. | Livno. | Yelets. |
| 1st quality flour. . | 27.50  | 23.33     | 23.00      | 39.17            | 20.83  | 19.17   | 16.67     | 16.66    | 15.66  | 15.50   |
| 2d    >    >    . .  | 12.50  | 16.66     | 13.50      | 29.17            | 30.00  | 40.83   | 41.67     | 10.00    | 39.58  | 39.50   |
| 3d    >    >    . .  | 25.00  | 14.17     | 19.75      | 6.67             | 15.00  | 11.66   | 15.00     | 18.75    | 8.75   | 9.00    |
| 4th    >    >    . . | 9.20   | 12.50     | 13.00      | 4.17             | 9.17   | 4.58    | 6.67      | 14.58    | 4.58   | 4.75    |
| 5th    >    >    . . | 3.30   | 6.67      | 5.25       | 2.50             | 4.17   | 4.58    | 3.33      | 10.41    | —      | —       |
| 6th    >    >    . . | 1.70   | 5.83      | 4.30       | —                | —      | —       | —         | 8.33     | —      | —       |
| 7th    >    >    . . | —  | 4.17      | 2.10       | —                | —      | —       | —         | 2.91     | —      | —       |
| Bran . . . . .       | 18.80  | 15.00     | 16.10      | 16.66            | 16.66  | 16.66   | 16.66     | 16.16    | 27.66  | 27.50   |
| Waste . . . . .      | 2.00   | 1.77      | 3.00       | 1.66             | 4.17   | 2.52    |           | 1.90     | 3.75   | 4.75    |
| Total. . .           | 100.00   | 100.00    | 100.00     | 100.00           | 100.00 | 100.00  | 100.00    | 100.00   | 100.00 | 100.00  |

The large mills in Russia seldom take orders for grinding; they buy the grain and sell their own flour. Every mill has its own valuation for its flour of various sorts. Some of the millers producing 6 sorts of flour settle the difference between the prices of the 1st and 2nd quality at 20 kopecks (paper value) per pound, or 10 cents per 36 English pounds. Almost the same difference may be adopted for the 6th quality and the bran. The difference between the 2nd and 3d, and 3d and 4th qualities is almost double that between the 5th and 6th, three and three and a half times as great as that between the flours of the best qualities. The absolute market price of flour depends upon the price of the wheat, and the cost of its transport to the mills, and of its grinding, upon the position of the market, and upon various commercial combinations. In every case the Russian millers enjoy such considerable profits as can scarcely be received from such operations in foreign countries. The production of flour from other cereals, husk plants, and potatoes is inconsiderable, owing to the small demand therefor.

The general condition of the more firmly established part of the milling business in Russia may be seen from the following official data for 1889 and 1890.

| LOCATION OF MILLS.        | The number of mills. | MOTORS AND THEIR POWERS. |                  |                   |                   | Number of hands. | Production in tons. | Value in millions of roubles. |
|---------------------------|----------------------|--------------------------|------------------|-------------------|-------------------|------------------|---------------------|-------------------------------|
|                           |                      | Water.                   | S t e a m.       |                   |                   |                  |                     |                               |
|                           |                      |                          | Number of motors | Number of motors. | Number of powers. |                  |                     |                               |
| 1889.                     |                      |                          |                  |                   |                   |                  |                     |                               |
| European Russia . . . . . | 5,073                | 5,429                    | 887              | 15,984            | 930               | 24,360           | 2,118,050           | 152                           |
| Poland . . . . .          | 516                  | 593                      | 76               | 1,966             | 82                | 2,090            | 128,143             | 10                            |
| Caucasus . . . . .        | 337                  | 531                      | 72               | 760               | 76                | 1,183            | 72,127              | 5                             |
| Siberia . . . . .         | 515                  | 143                      | 18               | 335               | 15                | 1,562            | 67,068              | 6                             |
| Turkestan . . . . .       | 158                  | 10                       | 1                | 6                 | 1                 | 261              | 17,521              | 1                             |
| Total . . . . .           | 6,599                | 6,706                    | 1,054            | 19,051            | 1,104             | 29,456           | 2,402,909           | 174                           |
| European Russia . . . . . | 5,605                | 7,972                    | 711              | 15,742            | 814               | 25,085           | 2,168,342           | 137                           |
| Poland . . . . .          | 591                  | 580                      | 72               | 1,791             | 113               | 2,081            | 165,665             | 11                            |
| Caucasus . . . . .        | 416                  | 844                      | 58               | 788               | 64                | 1,061            | 56,650              | 4                             |
| Siberia . . . . .         | 234                  | 216                      | 20               | 393               | 23                | 1,050            | 47,953              | 3                             |
| Turkestan . . . . .       | 157                  | 11                       | 1                | 6                 | 1                 | 361              | 23,957              | 1                             |
| Total . . . . .           | 7,003                | 9,623                    | 862              | 18,720            | 1,105             | 29,638           | 2,462,569           | 156                           |

Of the administrators, such as have received a technical education, there were in 1889: Russians, 35; foreigners, 20; such as have had no special technical education, 4,329 Russians, and 69 foreigners; in 1890 there were: Russians with technical education, 42; foreigners, 25; without such education, Russians, 6,914; foreigners, 106.

In the figures, 2,462,569 tons of the total production for 1890, 136,790 tons of bran obtained by millers in different provinces, with the exception of Turkestan, according to official data are included. The greater number of mills in 1890, as compared to that in 1889, is explained by the fact that some of the farm mills have been declared commercial undertakings; the decrease in the number of steam engines and boilers in 1890 is explained by the circumstance that in 1889 many of the small mills organized at other works and manufactories are represented as possessing motors of their own. The grinding mills of the Department of War, providing the Russian army with flour, must be reckoned in the number of those firmly established and well equipped. There are sixteen such mills; of these 14 are moved by steam engines, yielding on the whole 1,110 horse power, and 2 have gas motors yielding 115 horse power. The yearly production of these mills, reckoning 280 work days per year, is about 950,000 chetverts of rye, or 5,663,000 American bushels, equalling 8,500,000 pounds or 137,045.5 tons.

On assuming that the population of the Empire amounts to 110 millions, and that in European Russia its number exceeds 85 millions, and admitting further a



yearly consumption of one-fourth ton of rye and wheat per capita, it is easy to notice that the official data register only one-ninth of the flour consumed in the Empire, or one-eighth of that consumed in European Russia. Moreover, this flour is used in many manufactures, for instance in the distilleries; it also forms a somewhat considerable foreign export, as will be seen below, and an equal quantity is sent to Finland. All these facts lead to the conclusion that the local household production of flour by hand or by windmills, water or animal power, is still strongly developed in Russia, although such methods of manufacture, owing to special circumstances, are completely excluded from official registration.

The shipment of flour abroad is insignificant and, in comparison to the export of grain, of no great importance, as follows:

|   |                |
|---|----------------|
| In 1889 flour of all kinds except potato flour. | . 49,795 tons. |
| > 1890   >   >   >   >   >   >   > .            | . 39,300 > *   |
| > 1891   >   >   >   >   >   >   > .            | . 41,283 > **  |

The export of bran from Russia is comparatively greater, a fact which generally speaking is undesirable, and may be shown as follows:

| Years.     | Tons.   | Years.     | Tons.   |
|------------|---------|------------|---------|
| 1884 . . . | 86,145  | 1888 . . . | 211,236 |
| 1885 . . . | 61,433  | 1889 . . . | 179,352 |
| 1886 . . . | 70,718  | 1890 . . . | 171,372 |
| 1887 . . . | 104,764 | 1891 . . . | 126,380 |

As to the import of flour to Russia, it has not the least influence on the Russian production, due to the protection of high custom duties. In 1890 it reached 3,170 tons, and in 1891, about 2,120 tons, including a certain quantity of groats and malt. Owing to so small an import of meal supplies, their home production is still largely developing. Macaroni and vermicelli are also made with great success at some of the Russian mills, as well as in other establishments; the mealy breaks obtained at the *kroupchatka* mills are used in their manufacture.

From all that has been said about the present condition of the milling industry in Russia it may be concluded that it will attain a large development, leading to a cheaper and more convenient way of satisfying the local demands for flour, as well as to a larger shipment abroad, supplanting to some extent at least the export of grain thereto.

The manufacture of groats for cooking purposes, and especially for various gruels, forming one of the principal foodstuffs of the bulk of the Russian population, is

---

\* Including 26,280 tons of wheat flour to the value of 3,153,600 roubles; and 12,230 tons of rye flour, to the value of 673,000 roubles.

\*\* Including 29,295 tons of wheat flour to the value of 3,515,400 roubles, and 11,463 tons of rye flour, to the value of 630,400 roubles.

of course closely associated with the flour-grinding business. For this purpose the grain is either simply broken, receiving an angular form, as for buckwheat; or it is cut into a regular shape, as practised for pearl groats made of barley, or groats from other grain, including buckwheat, which, when receiving a round shape, is known in Russia by the name of *Smolensk* groats.

The sets for producing groats mostly consist of one stone turning on a vertical or horizontal axis, and working not with its flat, but with its cylindrical surface. The grain settles in the circular space, between the stone and the casing which, in sets with horizontal axes, also has a rotatory motion, but in a direction opposite to that of the stone. The feed is given successively; when the desired shape is obtained the ready groats are let out, and a new feed poured in. The feed of the grain and the delivery of the ready product are often done by automatic machinery, which works at will the number of the rotations of the upper millstone, depending on the quality of the grain and the sort of groats produced. The further work consists in separating the groats from the hulls and flour, and in grading them according to size by means of bolters and sieves. The finishing process is the polishing; it is done in sets of the same type, but instead of stones, smooth wooden rollers are used. The groats are fed into the sets together with the hulls, which are afterwards fanned by means of aspirators. Before the grinding of the groats the grain is carefully sorted and separated from the hull with the help of purifiers and hulling machines. For the preparation of fine groats or grits, the grain is cut into pieces by cone-fluted rollers and other similar machines. In most cases instead of this, the rounding of the grain is continued for some time; in this way the quantity of flour-dust is certainly much larger, at the expense of the production.

The general organization of mills for grinding groats, as a special article of trade, is most simple. Such mills either exist as independent establishments, or form a part of large flour mills or other works using their motors. The manufacture of groats, as an independent branch of industry, is but little developed in Russia; in the villages, groats as well as flour are often prepared at home in the most elementary way, which excludes every possibility of official registration.

According to the official data for 1890, there were 304 groats mills working independently, besides 281 established at flour mills and other manufactories and moved by their motors. The total production of all these mills amounts to about 100,000 tons, to the value of 6,899,000 paper roubles, or 3,539,000 dollars. A certain portion of these goods, of a better make than the local and home-made products, are exported; a very small quantity goes to Finland. The shipment of groats abroad was of late years as follows:

| Years.       | Tons.  |
|--------------|--------|
| 1889 . . . . | 21,347 |
| 1890 . . . . | 25,039 |
| 1891 . . . . | 16,961 |

Concerning the import of grain it must be remarked that except rice, not grown in Russia and mostly brought from Persia in the form of groats, all such goods are imported in very small quantities; this may be seen from the official data referring to the import of flour, in which groats are included.

It has been already mentioned that the manufacture of groats has no great development in Russia. Indeed, if the yearly consumption per capita be reckoned at about 50 pounds, the total for European Russia alone will reach over 2,000,000 tons; but in a country where gruel is such a common meal, the demand for groats must be much greater. On considering these facts, as well as those reported in the official data already mentioned, it is obvious what an enormous development awaits this branch of manufacture in Russia.

#### THE MANUFACTURE OF LUBRICATING OILS\*.

The production of tallow and other animal fats must be classed among the important branches of Russian industry; but in comparison with former years the trying of tallow and of lard has considerably decreased. According to official data for 1880 to 1884 there were in European Russia, including Poland, 453 tallow manufactories with a yearly output to the value of 8,618,000 roubles; in 1885 to 1889 the number of such factories fell to 300, their yearly production amounting to 5,508,000 roubles. Such a decline in the industry is explained by the decrease in the demand for tallow in the interior, as well as on the foreign markets, resulting from the rising consumption of mineral oils, both lighting and machine oils. It is well known that the production of naphtha has increased in Russia five times from 1882 to 1892; the manufacture of machine oil has also greatly developed during the same period. Besides, the number of cattle in the eastern governments of Russia have also much decreased in the same decade, owing to the development of agriculture and the increase in the population, thus unfavourably influencing the yield of tallow.

The principal region of the tallow industry is at present the western part of Siberia, government of Tobolsk, the steppes of Central Asia (the district of Akmo-linsk); and in European Russia the Don Kossacks district, where the tallow business is still flourishing, owing to the considerable numbers of cattle in the steppe districts of these localities. Of the governments which are far from these provinces, and where cattle are mostly bred for slaughter, the tallow industry as a registered branch of manufacture is important only in the government of St. Petersburg, its output of tallow amounting to 700,000 roubles. Here the industry is kept up by the existence of large slaughter houses, whither great herds of cattle are brought from remote localities, and by the extensive development of the manufactures of soap, candles, and cosmetics. All the 642 tallow manufactories in the Empire yield 1,100,000 pounds of beef and mutton tallow, to the value of 3,750,000 roubles.

Of no little importance is the extraction of oils from the larger kinds of marine animals, of which the whale, the *belouga*, white grampus (*delphinapterus leucas*), the walrus, and the seal (*phoca*) are found in the Arctic Ocean; dolphins and seals also live in the Black Sea, and the latter are found in the Baltic and Caspian waters

---

\* Part of the data concerning not only the growing of oil plants but also the manufacture of vegetable and animal oils are included in Agriculture and Forestry, Volume III, of this work, where the reader will also find information about many other foodstuffs, such as milk and its products, wine, fish, and other industries.

as well. Of these animals only the whale, the walrus, and the seal are taken; the catching of whales is scarcely begun, and that on the coasts of the Pacific, where small whales are still to be found. In the north the principal oil is obtained from the white grampus, *belouga*; if the hunt be successful, from 20,000 to 80,000 pounds of oil are extracted from the catch. On the Caspian Sea oil is mostly obtained from seals, its quantity amounting to 100,000 pounds.

Besides the sea mammalia, oil is produced from many kinds of fish. The most important point of such production, owing to the abundance of material, is the coast of the Caspian. Oil is mostly obtained from the so-called *chistikovi* fish. In former years it was principally produced from Astrakhan herring (*clupea caspia*), but since these have been salted and sold for food other fish have been taken for the oil. At present the greatest quantity of fish oil is furnished by Volga lampreys (*petromyzon Wagneri*). The total amount of fish oil obtained at the Caspian fisheries is from 50,000 to 70,000 pounds yearly; it is also produced on the shores of the Arctic ocean, but on a small scale.

Fat is employed in the manufacture of oleomargarine, candles, stearine, oil and other products. The margarine factories are not numerous, but their production is larger than that of the registered tallow works. According to recent data there were 6 such factories, with a production amounting to 1,500,000 roubles. Half of these works, and 58.3 per cent of the production, fall to the government of Moscow alone; the rest of the factories are divided between the governments of St. Petersburg, Kherson (Odessa), and Warsaw. As the widely spread sale of oleomargarine instead of butter, a more costly article, has been more than once noted, measures have been taken by the police and sanitary authorities to check the industry, followed by a great decrease in the amount of manufacture.

The making of tallow and stearine candles and soap, is closely connected with the tallow industry. The production of tallow candles obviously tends to decline. In 1880 to 1884 there were in European Russia, Poland included, 479 tallow candle manufactories, with an output of 2,297,000 roubles; in 1884 to 1889 their number decreased to 145, and the value of the production to 549,000 roubles. This considerable decrease in the output is the result of the vast spreading of kerosene among the bulk of the population, because of the fact that it is cheaper, and gives a much better light, than tallow candles. The tallow candle works in Russia are generally small; the largest of them, in Moscow, produce candles for less than 100,000 roubles; the yearly production of most of the others ranges from 1,000 to 5,000 roubles.

The stearine production is more active, although the development of the naphtha industry has also had an unfavourable influence thereon. In the period from 1880 to 1884, 15 Russian stearine factories produced goods to the value of 11,614,000 roubles; five years later (1884 to 1889) their number decreased to 13, with a production of 8,861,000 roubles. The making of candles has long ago ceased to be the sole speciality of the Russian stearine works. Although they still produce candles on a large scale, other products have been added to the list, such as glycerine, olein and olein acid. The total quantity of different goods produced by the stearine factories amounts at present to 1,426,100 pounds, of which 73 per cent fall to stearine candles, 0.07 per cent to palm candles, 7.1 per cent to glycerine and 16.9 per cent to olein. This manufacture is chiefly centred in the governments of St. Petersburg,

Kazan, Moscow, and Warsaw. The stearine factories use not only tallow, which gives as a by-product candles of second quality and rarely required, but also palm oil which changes the quality of the stearine.

Of all the branches of the industry dealing with fats and oils as materials of production, the manufacture of soap is in the most favourable position; as the demand for soap is constantly increasing among the Russian population, and is almost entirely satisfied by the home production, the import of foreign soap is very limited. In Russia 466 manufactories are engaged in the making of different kinds of soap; their production amounts to 2,636,500 pounds, to the value of 8,388,000 roubles. As the prices for tallow have fallen in recent years, the soap manufactories, situated in some of the Russian ports, began to use in their works, besides Russian grease, foreign fats, and to a certain extent coconut oil, produced in Russia from the pulp of palm nuts, and copra brought from the tropics. As coconut oil is very saponific, it easily communicates this quality to the other fatty materials added to it; the excess of water contained in it favours the admixture with different soluble salts, and other substances of which the Russian manufactories, following the example of the foreign works, try to avail themselves, much to the expense of the product.

The manufacture of soap is spread almost over all Russia, but it is principally centred in the governments of Moscow, St. Petersburg, Kazan, Kherson, and Warsaw. In St. Petersburg, Moscow, and Warsaw some firms produce soap of high quality, the prices of which are much lower than those of foreign makes.

The production of tallow and stearine candles, as already mentioned, gradually decreases. Just the reverse may be said with regard to wax candles, as their manufacture increases constantly. In 1880 to 1884 there were in Russia, the Asiatic provinces excluded (Siberia and central Asia), 214 manufactories with a production valued at 4,444,000 roubles; in 1885 to 1889 their number increased to 248, the value of the output being 5,108,000 roubles. In Russia wax candles are exclusively employed for church use, namely, for lighting and for burning before the sacred images (ikons); in their manufacture not only beeswax is used, but also purified mineral wax (ozocerite, ceresin). Ozocerite was brought from Galicia in the beginning of the sixties, and was soon universally employed as a very important material in the manufacture of imitation wax. Not differing much from beeswax, and more easily admixed with it than other surrogates, it is at the same time infinitely cheaper than the latter. In 1881, in order to further the home production of ozocerite, layers of which were discovered in the islands of the Caspian Sea (Holy Island and Cheleken), and to maintain the Russian agriculture and beeswax bleaching works, foreign ozocerite and ceresin were taxed with a high customs duty. In consequence the import of ceresin decreased, but the ozocerite was brought in greater quantities, as special factories were established in the region of the Vistula, government of Petrokov, for the working of ceresin from the Austrian ozocerite. At present there are 5 ceresin works, their production amounting to over 140,000 pounds, to the value of 1,293,000 roubles. As only 16 factories are making candles from pure ceresin as a speciality, to the value of 100,000 roubles, the greatest part of the remaining material is probably used as an admixture of beeswax.

In order to ensure the making of tapers from pure wax, the output of the diocesan wax candle manufactories in Russia has been increased. As the demands for

wax candles are very large, the factories producing them are found almost every where, but the larger ones are centred in the government of Moscow. The number of wax candle works amounts now to 260, their production being 230,000 pounds, to the value of 5,340,000 roubles. For the making of paraffin candles there are 2 manufactories, with a yearly output of 210,000 roubles. They are both situated in the Vistula region.

The following data concerning the average export for the periods of 1881 to 1885, and 1886 to 1890, give an idea of the insignificance of the turnover of the Russian trade in substances obtained from animal fats, as well as in ozocerite and ceresin.

|                          | EXPORT IN POUNDS. |               |
|--------------------------|-------------------|---------------|
|                          | 1881 to 1885.     | 1886 to 1890. |
| Tallow . . . . .         | 262,594           | 233,831       |
| Soap . . . . .           | 26,135            | 44,606        |
| Stearine . . . . .       | 749               | 35            |
| Paraffin . . . . .       | 140,989           | 16,329        |
| Wax . . . . .            | 2,393             | 1,374         |
| Tallow candles . . . . . | 2,245             | 5,506         |
| Wax > . . . . .          | 283               | 850           |
| Stearine > . . . . .     | 26,762            | 48,449        |

|                                    | IMPORT IN POUNDS. |               |
|------------------------------------|-------------------|---------------|
|                                    | 1881 to 1885.     | 1886 to 1890. |
| Tallow . . . . .                   | 299,162           | 158,845       |
| Whale and cod-liver oil unpurified | 37,658            | 39,912        |
| Soap . . . . .                     | 14,826            | 10,581        |
| Stearine . . . . .                 | 47,506            | 9,421         |
| Paraffin . . . . .                 | 37,596            | 54,287        |
| Beeswax . . . . .                  | 8,570             | 30,348        |
| Ozocerite . . . . .                | *                 | 266,060       |
| Ceresin . . . . .                  | 74,178            | 17,661        |
| Candles . . . . .                  | 13,895            | 6,989         |

\*) Ozocerite has been mentioned separately only since 1885.

Besides this, a certain quantity of fats and vegetable oils, as well as purified cod-liver oil, has been imported. If a certain decline in the production of animal fats and oils is observed, that of the vegetable oils on the contrary is visibly on the increase. In the period of 1880 to 1884 such oils were produced in European Russia, Finland excluded, to the value of 11,303,000 roubles and in the years 1885 to 1889, to 14,000,000 roubles.

It should be mentioned that these figures show only the dimensions of the output of the factories, independent of which a great number of small oil mills owned by peasants are scattered over all Russia \*. The products of this branch of industry are various, owing to the fact that the culture of different oleaginous plants is widely spread in Russia. Oil is obtained from linseed (*linum usitatissimum*), hempseed (*cannabis sativa*), sunflower (*heliantus annuus*), mustard seed (*sinapis*), rape or colza seed (*brassica campestris oleifera*), turnip, cabbage seed (*brassica napus oleifera*), poppy seed (*papaver somniferum*), castor-oil plant seed (*ricinus communis*), sesame seed (*sesamum orientale*), China turnip seed (*raphanus sativas*), lallemantia cress, *camelina sativa*, and others.

Besides this, oil is made from foreign imported materials, for instance, cocoa and palm oil. The production of special kinds of oil at separate mills depends to a considerable degree on their geographical position, on the area of the culture of oleaginous plants; generally such oil is produced from the plants grown in the locality. An exception is made in the case of large manufacturing centres, such as St. Petersburg, Moscow, Riga, Odessa, to which material is brought from all the provinces. As the culture of flax and hemp has been one of the most widely spread from time immemorial in Russia, factories for producing oil from their seeds are the most numerous. According to the crops, the yield of linseed in European Russia amounts from 11,000,000 to 22,000,000 pounds, and that of hempseed from 4,400,000 to 14,000,000 pounds. The official data give the number of oil mills producing hemp seed oil as 268, yielding about 712,000 pounds, to the value of 2,446,000 roubles; and that of mills producing linseed oil, as 119 with a production of about 540,000 pounds, to the sum of 2,830,000 roubles. As the hemp-growing area does not quite coincide with the limits of the culture of flax for seed, the mills for making hemp and linseed oil are not equally distributed in different governments. The principal localities where hempseed oil is produced are: the governments of Chernigov, Orel, Smolensk, Kaluga, and Kursk; linseed oil is mainly produced in the governments of St. Petersburg, Kherson, and in Lithuania, and to some extent in the governments of Orel and Vladimir. It may be stated that the manufacture of hempseed oil keeps within the limits of the area where the plant is grown, not so the production of linseed oil.

The making of oil from the seeds of the sunflower is also vastly spread in Russia, notwithstanding that its establishment in comparison with that of hempseed and linseed oil is quite recent, dating only from the forties. Until then the sunflower was cultivated only as a garden flower, for the adornment of yards, as well

---

\*) An example of the number of such mills is represented by the government of Kursk, in which there are 1,414 small oil mills, while only 40 large factories, with a production of 1000 roubles and more.

as kitchen gardens. The first to introduce a larger cultivation of the sunflower were the inhabitants of the government of Saratov; the peasants liked so much the taste of the kernel, which somewhat resembles that of the cedar nut, that it soon came into great demand. The development of the culture of the sunflower, and of the manufacture of oil from its seeds, is in a great part due to an accidental circumstance. A peasant of the village Alexeievka, government of Voronezh, Bocarev by name, came to Saratov; on noticing how much the kernel of the sunflower resembled the cedar nut, from which an excellent table oil was extracted, he hit upon the idea of using the seeds for making oil. He bought some in Saratov, and on his return to Alexeievka sowed them there. The crop was very good, and he tried the experiment of producing oil, and obtained some of the best quality. The first success encouraged him to enlarge his field, and soon he was able to sell some of the new product. The other peasants of Alexeievka followed his example in growing the sunflower, the cultivation of which spread over the districts of Ostrogozhsk and Valouysk; the inhabitants of the town of Saratov also began to take an active part in the industry. The demand for the new product suddenly increased to a remarkable degree, and it soon found ready markets in Moscow, St. Petersburg, and other large towns, and even abroad.

The majority of the now existing oil mills were founded in the eighties, due to the increase of the sunflower fields, influenced by the ready sale of the oil; in the period from 1880 to 1886 the quantity of land under sunflower increased by 98 per cent. However, not the whole crop of sunflower seed is brought to the mills to be worked into oil; a considerable portion of it is eaten as a nut, the seeds being therefore classified into crack kernels (*grysovyie*) and oil kernels (*maslichnyie*). The number of oil mills working sunflower seed amounts to 109, but they are larger than those producing hemp seed oil; their output reaches over 600,000 pounds, to the value of 2,185,000 roubles. Nevertheless this manufacture does not comprise a very large region, it exists only in 9 or 10 governments; 82.3 per cent fall to the government of Saratov, and 13.2 per cent, to that of Voronezh. Owing to the limited area of the cultivation of the sunflower, its crop has a great influence upon the number of oil mills, especially of the smaller ones. In years of bad crop they lessen their activity, or stop work altogether. However, even if the crop be good, such mills work only during 5 to 7 months, from September to April. The sunflower oil has no unpleasant taste, and no odour, is remarkably clear, and has little colour; it belongs to the number of easily dried oils, and therefore it is not only used for the table, but also for the preparation of oil colours.

Mustard oil is made almost exclusively in the southern part of the government of Saratov. This manufacture was induced by the initiative of the Imperial Free Economic Society which, in 1799, sent to the colonists settled in Sarepta some mustard seed; but the making of oil therefrom remained for a long time almost a monopoly in the family of the colonist Glich. This firm was the only one producing mustard oil, its articles being of a high quality, but rather dear, owing to the lack of competition. The manufacture developed greatly and the goods grew cheaper since other makers began to rival Glich, and especially since 1884 when the firm V. Voronine and Son established at Doubovka a large and perfectly organized oil mill, which greatly influenced the growth of the demand for mustard seed, and prices advanced accordingly.



On the other hand, the article produced grew cheaper owing to competition, and enjoyed a larger sale. At the present time the production of mustard oil amounts from 50,000 to 55,000 pounds, valued at 320,000 to 350,000 roubles. The region of its sale gradually increases, due to its high quality, and the demand for it always outgrows the supply. The making of mustard oil is closely connected with the growing of mustard, which reaches yearly 100,000 to 110,000 pounds.

The manufacture of rape and turnip-cabbage seed oils, in which 57 oil mills with a production of 900,000 roubles are engaged, is chiefly centred in the Vistula region, in the Baltic and southern governments (Odessa). The production of castor-oil from ricinus exists principally in Moscow, and in the Vistula region; 5 mills are engaged in the manufacture, with a yearly output of 115,000 pounds, to the value of 730,000 roubles. It is principally used for the preparation of the so-called alizarine oil, employed in the dyeing of calico Adrianopol red. Sesame oil is mostly made in the south of Russia, in the governments of Kherson (Odessa) and Tiflis, and in the Transcaspian region.

Besides the oils obtained from oleaginous plants cultivated in Russia, some cocoa and palm oils are produced from the foreign raw material. Although only 5 mills are engaged in this industry, their average yield is about 240,000 pounds, to the value of 1,200,000 roubles. As the material for the making of cocoa oil (pulp of coconuts, or copra) is brought from tropical countries, the cocoa oil mills are situated in the nearest vicinity to the frontier, namely, St. Petersburg, Libau, Riga, Odessa. The quantity of palm oil produced in Russia is quite insignificant, as compared to that of cocoa oil; it amounts only to 4,000 pounds, to the value of 23,000 roubles.

To complete this review it should be mentioned that the official data cover, besides the number of factories working vegetable oils, 60 factories engaged in the production of various kinds of oil, their output reaching 2,140,000 roubles, 77 per cent of which falls to the Baltic region.

Some of these oils, namely, rape and cocoa oil, together with olive, castor, and vaseline oil, are used in the manufacture of artificial lamp oil, the so-called *garnoie*, a substitute for olive oil; some of the factories of Moscow, St. Petersburg and of other towns, are engaged in this manufacture. The cocoa oil is added to give the mixture a greater consistency, to increase its specific gravity, and to render it capable of freezing. The principal compound part of the oil called *garnoie* is vaseline, more often called *perfumer's naphtha* oil. It is a light, lubricating oil with no colour, obtained by a very good purifying of the product of naphtha, holding the mean between the solar and the lubricating oils. Besides the above mentioned materials, some of the factories prepare artificial olive oil from cod-liver oil, sunflower oil, et cetera. In order to give the product a greenish colour chlorophyll (bought in extracts or prepared at the factories from nettles) and artificial aniline pigments are used. The analyses of the artificial olive oil have shown that it contains only from 10 to 35 per cent of pure olive oil, while the principal ingredient, vaseline, sometimes reaches 75 per cent.

The foreign trade in vegetable oils, during the decade 1880 to 1890, was as follows.

|                                | AVERAGE EXPORT IN<br>POUNDS. |            |
|--------------------------------|------------------------------|------------|
|                                | 1881—1885.                   | 1886—1890. |
| Hemp seed oil . . . . .        | } 8,832                      | 10,866     |
| Linseed oil . . . . .          |                              | 19,293     |
| Sunflower oil . . . . .        | 14,331                       | 1,201      |
| Other vegetable oils . . . . . | 27,736                       | 37,229     |

|                              | AVERAGE IMPORT IN<br>POUNDS. |            |
|------------------------------|------------------------------|------------|
|                              | 1881—1885.                   | 1886—1890. |
| Cocoa and palm oil . . . . . | 229,251                      | 239,870    |
| Olive oil . . . . .          | 1,276,725                    | 715,160    |



## CHAPTER XXI.

**Ship building and Navigation.**

**T**HE extent of the Russian Empire, without counting the considerable inland water surface, is equal to 8,343,155 English square miles. The northern part is washed by the Arctic Ocean, the eastern by the Pacific; to the south stretch the Caspian and Black seas; and to the west, the Baltic. The oceans break into the continent, forming extensive gulfs, known as separate seas, such as the White, the Behring, and the Okhotsk. The total length of the coast line is 19,325 miles, and of this 12,600 miles in straight lines fall to the share of the oceans and seas. As, however, the winding nature of the shores increases the length of the coast line to more than double this number, its total length may be taken as about 26,516 miles.

The inland seas and lakes have a total area of more than 351,000 square miles. The Caspian Sea covers 185,000 square miles; the Sea of Aral, 26,364; the Sea of Azov, 14,300; Lake Baikal, 13,000; Lake Ladoga, 7,000; Lake Onega, 3,540; Issykul 2,640 miles; while as many as thirty lakes have an area varying from 440 to 2,200 square miles. All these lakes have rivers flowing into them, and form systems of water ways.

The rivers of the Empire are among the largest in the world. The river Obi flows through 3,250 miles; the Lena, 2,850; the Amour, 2,790; the Volga, 2,220; the Upper Tunguzka, 1,820; the Lower Tunguzka, 1,665; the Ural, 1,500; the Dnieper, 1,340; whilst twenty-seven other streams have a length varying from 663 to 1,300 miles. Besides this, there are as many as a hundred rivers in European Russia, which form part of the regular systems of navigation, vessels being able to ply both up and down their courses. There are also many rivers which only allow of vessels being floated down; and a whole network of streams and rivulets are used for floating lumber and logs in springtime. The total length of all the rivers in European Russia for navigation and rafting exceeds 66,290 miles; this includes a length of 13,300 miles suitable for steamers.

The extent of the Russian Empire from north to south is  $42^{\circ}$  or 2,900 miles, and from east to west,  $167^{\circ} 41' 29''$  or 6,670 miles; therefore cheap water communication is a question of the highest importance to the economical development of the country. From the time of Peter the Great the Government has been occupied in connecting the basins of rivers falling into the various seas, and from 1703 until 1850 the work of connecting the seas has been continuously carried on. At the present time the Caspian and White seas are connected with each other, and also with the Baltic, the latter being also joined to the Black Sea. These artificial connections, by means of canals between the basins of rivers, have furnished uninterrupted inland navigation from Astrakhan to Archangel, a distance of 2,810 miles; from Kherson to Tilsit, 1,532 miles; and from Kherson to Riga, 1,525 miles. The rivers and their tributaries make up 19,900 miles; so that only 398 miles, or about 2 per cent, fall to the share of the canals. At present the work of connecting the Obi and Yenesei in Siberia is being carried on there; by digging a canal 4.64 miles long, and clearing the tributary streams for a length of 133 miles, a network of water-roads 13,258 miles long will be formed, which will give an exchange of produce over 1,989 miles longitude, and 3,971 miles latitude. All these water roads, passing through different climates and greatly varying degrees of culture of the inhabitants, comprise so many means of transport that only a very long list would enumerate them. Beginning with the small streams and rivulets, where the timber is floated down in loose logs or chains of logs linked together in single file, or by forming a girdle surrounding loose logs, or else in simple rafts. Afterwards, passing into the rivers, the wood is lashed into rafts of several layers, and the logs and other forms of timber are loaded on barges, lighters, and other vessels constructed only for one voyage. The more costly kinds of merchandise have called forth progressive improvement in the type of vessels, varying from the simplest kind to the steel steamers of the most modern construction.

In Eastern Siberia, where the most primitive mode of life still prevails, locomotion is effected by means of rafts, boats, or canoes made of birch bark, skins of beasts, or bladders. On the Amour, the Yenesei, and other large streams of Siberia, ply also very luxuriously fitted steamers. On the rivers of European Russia, steamers of the American type, similar to floating palaces, are now much used. In short, the existing variety of craft on these waters furnishes data for the history of culture, embracing that of the art of ship building. Those remote corners, where civilization has not yet penetrated, show how navigation was practised a thousand years ago. In those places where agriculture, mining, and manufacturing industries are developing, the art of ship building has rapidly improved. In central and western Russia, where machine construction, manufacturing, and the European mode of life have taken root, the ship building is not in any degree inferior to that of Western Europe. There are as many as thirty types of steamers and sailing vessels for coasting and cruising in the merchant navy, and the fleet comprises vessels of twenty various denominations. These numerous types of large registered ships differ in design, materials, construction, means of propulsion, armament, commercial and warlike character. Each type has been the result of experience, and has its own history. It cannot be said that the mariners hold to their own models from conservative feelings; on the contrary, advantageous novelties are eagerly taken up, in order to compete for supremacy on the rivers and seas.

The introduction of the steam engine has naturally effected a thorough revolution in navigation, as well as in all other branches of trade. The vessels towed by the steamers have also changed their construction, as well as the steamers themselves. The substitution of steam for sails, of steamers instead of towing straps and horses, have necessitated new tackle, new proportions of length and breadth in the vessels, and in general created a new era in ship building and naval architecture. The teams of horses have only quite lately passed away; formerly, about thirty horses were harnessed to a capstan and windlass apparatus, which was pulled to an anchor fixed higher up stream; they used to tow a line of barges, carrying over 1,000 tons freight, at the rate of a mile and a quarter per hour. Winches were then introduced, and forty-horse power steam engines took the place of horses, and a speed of one and a half miles per hour against the stream was attained. These again did not last long but soon gave way to steam tugs and steamers, which now take the lead in transporting goods and passengers on inland waters. Until the introduction of steam-traction, the law provided that there should be three workmen on the vessels for every fifteen tons of merchandise. The vessels, which were decked barks, carried a very heavy mast and clumsy sail, which only allowed them to sail under full wind. When the wind was from the side, the vessels used to lie at anchor; in fair weather the towing-tackle was used, where the nature of the bank permitted, or the anchor was carried forward in a row boat and dropped, when it was used to pull up to, the rope being hauled in on the deck. The loss of time by this method and great expense of the journey, in consequence of hiring such large gangs of workmen, enabled the first steam tugs to pay 20 to 30 per cent per annum on their capital. The steamers were in such demand that they could choose those boats which offered the least resistance to the water; this selection brought forth a new type of vessels, called barges, which are now almost exclusively used on all the large rivers.

The introduction of steam power, besides affecting ship building, also made considerable changes in the social and economical condition of the population. Until steam tugs were used, the hauling trade was very much spread throughout the inland water roads; those who were free from agricultural labour hired themselves out, and in spring time the number of haulers on the rivers of European Russia amounted to about 600,000 men. Steam power has now taken the place of the haulers, and the democratic decked barks have lived their day, giving place to the barges and other types of boats towed by steam tugs. The barge is the favourite type on the Volga and its tributaries; 2,508 of them were entered in the list of non-steam vessels in 1890, according to the statistics of the Ministry of Ways of Communication. They are built of wood, and rarely of iron. They are flat-bottomed, like all river boats; instead of timber frames, the fir trees are dug out with the roots and fashioned into ribs, which are fixed on the bottoms. The sheathing and deck are made of pine-planking which is carefully caulked and coated with vegetable or naphtha tar. The hold is one storehouse without partitions, and the merchandise is loaded on the floor in sacks, bags or in bulk. The barges are used for conveying grain, salt, wood, cotton, fish, lime, timber, crockery, fruit, watermelons, and other goods. Since the widely-spreading consumption of naphtha, kerosene, naphtha refuse, and mineral lubricating oils, a whole fleet of barges is engaged in transporting these products, which are either loaded in bulk, or in barrels.

The life of a wooden barge is generally estimated at eight to fifteen seasons, but there are many in existence which have served more than twenty years. Iron and steel barges are generally amortized in twenty to thirty years. The barges on the Volga are from 65 to 335 feet long, 25 to 45 feet wide with a displacement of water from 2 to 9 feet. These barges carry from 100 to 3,000 tons. It is evident that such a heavy weight, even when moving with the slow speed of three or four miles an hour, acquires a very considerable momentum, so that any stranding will have a very deleterious effect upon them. Besides this, the barges are moored together in a caravan behind the steam tug, so any false movement affects the whole line, and this also considerably shortens the serviceable life of the barge.

The barges on the Volga are for the most part from 200 to 300 feet long, and, when fully loaded, carry from 1,000 to 1,350 tons. The cost of such barges, built of wood and fully rigged, is from 3,000 to 4,000 dollars. It is only under the most favourable circumstances that these barges are able to make in one season three journeys of 1,000 miles when loaded with merchandise. They are only fully freighted, to a displacement of seven or eight feet, during the first spring journey. The other journeys are effected with only one-third of the full load, or a displacement of three or three and a half feet. The freight for one to two hundred miles is about thirty cents per ton, and depends principally upon the harvest. In good years the charges of the steam tug are higher, but the ship owners also fare very well. The barges are built in proportion to the expectations of the crops, which can be judged at a very early stage. Thus, it may be seen that they were built in very large quantities in 1886, 1887, and 1888, when wheat was very abundant, and in much demand abroad.

On the Volga basin there are in all 2,508 barges, which, according to their length, capacity, and cost, may be classed as follows:

|    |     |        |       |     |      |      |
|----|-----|--------|-------|-----|------|------|
| 1. | 40  | barges | under | 70  | feet | long |
| 2. | 529 | >      | >     | 140 | >    | >    |
| 3. | 444 | >      | >     | 210 | >    | >    |
| 4. | 523 | >      | >     | 280 | >    | >    |
| 5. | 969 | >      | >     | 350 | >    | >    |
| 6. | 3   | >      | >     | 400 | >    | >    |

The first carry 30 to 80 tons freight, the second 400 tons, the third as high as 800 tons, the fourth 1,200 tons, the fifth up to 1,800 tons; and finally, there are the three barges of Nobel Brothers, which carry 1,700 tons of kerosene each. This fleet of barges when fully loaded can carry 2,500,000 tons. The cost of construction of a wooden barge may be estimated at about three dollars per ton displacement. Iron barges cost twenty dollars per ton. The number of iron barges is not mentioned in the lists, and therefore, if all the barges be counted as wooden, it will not be far wrong to state that the total cost of the barges on the Volga is about four million dollars.

In distributing the barges as to ownership, it will be seen that the small

boats are owned by small ship owners, who generally possess one, two, but rarely as many as five. As regards the larger barges, they are mostly the property of important merchants, joint-stock and steamboat companies. For instance, the grain-dealers Bashkirov and Blinov have 32 barges each; Bulychev owns 34; Zhuravlev, 42; the successors of Kurbatov, 56; Nobel Brothers, 74; the steamboat companies, Drouzhina, 56; Lebed, 50; the Caucasus and Mercury Company, 50.

Besides the barges on the Volga basin, there are also 150 *astankas*, 511 barks, 97 *gusiankas*, 70 ferry boats, 168 large barks, some special barks for the river Moksha, *amazonkas*, and long boats, in all, 4,824 vessels, according to official statistics. It may be mentioned that this list does not include those vessels which are only constructed for one cruise down the stream during the spring high waters. These are broken up at the end of their journey, and used for fuel and building purposes. The principal boats of this class are *belianas*, which are built in the wooded country up the river, loaded with wooden goods, sledge runners, felloes, spokes, naves of wheels, shafts, barrel staves, and the like, which fetch a high price in the poorly wooded districts of southern Russia. In some places these vessels are 350 feet long, 50 feet wide, and have a draught of as much as 14 feet; they carry 5,000 tons freight.

Amongst the peculiar kinds of navigation adapted to rapid winding rivers, that of the so-called plummet may be mentioned. This is an oval-shaped piece, either cast-iron, weighing about 1.61 tons, or a stone of the same weight, lowered by means of two hempen ropes from the prow of the vessel. The ends of the ropes are attached to the sides with pins, the vessel being steered with the helm and rudder. In straight reaches this weight is tightened up to the vessel in order to diminish its friction against the bottom of the stream; but where the river bends, if the ship does not answer the helm, it is steered by means of the ropes holding this weight, one end being slackened, and the other taut on the side to which the boat is to be directed. This method has only been in use about thirty years on the Volga basin, and the pilots are so skilful in applying it, that a weight of one ton enables them to dispense with ten men.

The whole of the Volga fleet, exclusive of steamers, is composed of 4,824 vessels, which last from three to fifteen years, giving an average of nine seasons. Therefore, the ninth part of this number, or 530 vessels, must be built every year in order to fill up the annual loss.

On the basin of the Northern Dwina ply 531 vessels; of these, 142 are barges, 76 *karbases*, 232 *kayuks*, and 81 *pausoks*. These barges vary from 85 to 210 feet in length, one barge only being 280 feet long and 32 feet wide, having a draught of six feet, and capable of carrying 1,000 tons; the majority only load from 300 to 500 tons. They are either floated down the current, or else towed by steamers; and they carry grain, flax, lumber, and various other merchandise to Archangel for foreign ports, or else for local towns and settlements. This region is scantily populated, and therefore return freights are rare for such large vessels up the Dwina, the exchange of produce being carried on with the *karbas* which are not more than fifty feet long, and when fully loaded only draw three feet of water, carrying ten to fifteen tons. They are manned by three men, go well under canvas, and enliven all the tributaries of the Northern Dwina.

That peculiar build of boat, called *kayuk*, is characteristic of this basin. They

ply upon the Kubensk lake, and along the Duke of Wirtemberg canal, which connects the White Sea basin with those of the Baltic and Caspian seas. As locks are frequent on these junctions, these boats have been constructed to accommodate themselves to the length and breadth of the chambers of the locks. These *kayuks* are from 110 to 126 feet long, 21 to 28 feet wide, and draw 4 $\frac{1}{2}$  feet of water with a cargo of 210 tons. They are either decked or half-decked, sometimes with planked roofs, and sometimes only having a penthouse. They are either towed by steamers, or else with ropes, according to circumstances; they do not last more than five seasons. They are cheaper to build than the Volga boats of similar dimensions, principally because wood is cheap, iron dear and little used for fastenings.

Upon the Neva basin, taken together with the Mariinsk, Tikhvin and Vyshni-volotak systems, which connect the Caspian Sea with the Baltic, there are 6,128 vessels. Here the predominating types are *polulodki* and *mariinki*; of the former there are 2,212, and of the latter 1,825. They ply upon the Mariinsk system between St. Petersburg and Rybinsk. They are from 126 to 140 feet long, 23 to 28 feet wide, and when fully loaded, draw from 5 to 7 feet of water; they carry from 300 to 500 tons freight. They only vary in the shape of the stern and of the prow. The *polulodki* have sharper curves, are built of better wood, have better-fitting frames and sheathing, and more solid iron fastenings. For this reason the *mariinki* only last from three to six seasons, and the *polulodki*, six to ten.

As the Neva and the Gulf of Finland form an outlet abroad for the whole of the Volga basin, which embraces twenty-four governments, as well as the Caucasus and the region beyond the Caspian, it is evident that the importance of the Mariinsk system increases rapidly in proportion to the development of Russia. In order to augment its capabilities of transport, it is being thoroughly reconstructed. The sum of 6,000,000 dollars has been voted to enlarge the locks, to enable them to accommodate the majority of the barges plying on the Volga. These improvements were designed at a time when most of the Volga boats were 210 feet long, and during the last five years an enormous number has been built upwards of 280 feet long. The idea was to enable the barges of the Kama, the Oka, and the Volga, to reach the seaport of St. Petersburg without unloading, to stand up alongside of the foreign vessels and unload directly into them. The project is therefore somewhat out of date, and probably the question of increasing the capacity of the Mariinsk system will soon come up again. This may be judged from the fact that, during the last ten years, the quantity of goods conveyed along the Neva and its lakes has varied between 2,170,000 and 3,330,000 tons, and as yet neither Siberia, across which a railway is now being laid, nor Central Asia, where industry is just commencing, hardly contributes anything towards these figures. The Mariinsk system, as well as the extensive basin of the Neva with its adjacent lakes, are a means of enlarging, developing, and enriching the Russian capital; wheat, fodder, building materials, fuel, and many other articles of consumption for the population of St. Petersburg and for export, are principally conveyed by water.

The list of vessels of the Neva basin, registered by the Ministry of Ways of Communication, to the number of 6,128, does not include those boats which are built in the upper parts of the river for one trip only. These are used for conveying wood and lumber, and are then taken to pieces, and used for fuel, fences, sidewalks,



and other purposes. According to the statistics of the River Police about one thousand of these come to St. Petersburg every year. In addition to this, more than 500 lighters are employed in reloading export and import cargoes between St. Petersburg and Cronstadt.

On these waters a special type of canal boat is used, plying on the Tikhvin system, which joins the Neva with the Volga through the Mologa. They are all of one size, namely, 65 feet long, 14 wide, and when fully loaded, draw  $2\frac{1}{2}$  feet of water. There are 178 in all; they carry fifty tons, and enliven the forest-grown and otherwise impassable region of this part of Russia. The dimensions of the boats correspond to the size of the locks, and eighty years ago were deemed sufficient for the requirements of St. Petersburg, and of export. They are used for conveying wheat, wood, hay, eggs, potatoes, glass, cheap furniture, and other wares. They serve as a home for their owners during the summer, and do not cost more than 150 dollars. It is rare that two or three of them belong to the same individual; usually one man possesses only one boat, which he and his family live in, and navigate during the whole season. This state of democracy disappears as soon as the boats become more valuable. The *polulodkas*, for instance, are all in the hands of a few owners: Mr. Ananin owns 70; Mr. Borovkov, 80; Zherebkov Brothers, 85; Messrs. Konetsky, 105, whilst many have five, ten, or more. The same holds good with the *mariinkas*: Okhlobystin Brothers own 54; Mr. Lubimtsev 60, and the firm of Gromov and Co. possesses 265 of these craft.

The abundance of wood round about St. Petersburg, the cheapness of labour and high price of iron, prevent the vessels on the Neva basin from lasting very long. They rarely survive ten seasons, and in general only serve six or seven; hence, about a thousand are built every year, out of large-sized and expensive trees. In the westward regions, however, the boats last much longer. On the Narova and Louga rivers, and the Chud and Pskov lakes, the canoes, boats, *polulodki*, barks, and *pausoks* serve fifteen and even twenty seasons. On the Western Dwina basin the Finnish barks are built to stand twenty seasons. The boats on the Niemen last twenty-five years, the *baidaks* thirty years, the *berlinas* fifty years, and the *batas* sixty years. On the Vistula, the Western Bug and Niemen, the *berlinas* last forty years; and the *habaras* forty-five and even as long as seventy years, being passed from one generation to another. Although the question of their longevity principally depends upon the quality of the oakwood, still careful handling and painting have a great influence on their durability.

On passing to the Dnieper, that historic Russian river that connects the Black Sea with the Baltic, it is evident that in this enormous basin the influence of the railways has put water communication into the shade. The Dnieper was at one time connected with the Western Dwina by means of the Beresinsk canal, forming a water way of 1,525 miles. This canal is now destroyed, as the lakes which supplied it are turning into marshes overgrown with weeds, and hardly give passage to rafts of timber in springtime.

According to the list of vessels on the Dnieper basin, exclusive of steamers, they are divided into two classes: there are 796 below the rapids, and 740 above. Of the former, the favourite type is the barge, of which there are 212 examples. These are towed by steam tugs to Nickolaiev and Odessa, and carry grain for

export; the other vessels are called, *trembaks*, brigs, *dubas*, and schooners. This is a remnant of the daring old school, where the true seaman of the sailing fleet was bred. All these vessels are from 22 to 110 feet long, 6 to 25 feet wide, draw from 4 to 10 feet of water, carry from 10 to 300 tons, and ply on the Dnieper, the Southern Bug, the Black and the Azov seas. All these types differ in build, manning, and rigging. They are strongly built, last as long as thirty years, and are used for carrying grain, salt, wood, vegetables, fruit, stone, lime, coal, and other merchandise. The owners of these boats complain of large steamers, barges, and cable boats, which are very hard for them to compete with; but as the trade continues to support them, this fleet continues to be renewed and repaired.

There have been many schemes for doing away with the rapids of the Dnieper which split up the river cruising, and prevent its being continuous. Blasting has been attempted canals have been opened around the rapids, and efforts have been made to ascend them by means of windlass apparatus. All these means do not present any particular technical difficulty, but it is entirely a question of cost. The rapids cover a distance of forty miles, the bed of the river is rocky, and the work would be very expensive, therefore no serious contractor, capable of carrying out the work successfully, has yet appeared.

There still remain the Don, Danube, Pruth, Dniester, and other rivers, having an aggregate number of 1,500 vessels. The total number of registered vessels in European Russia may be taken as 16,000. Siberia with its enormous river basins has been but little investigated, and its steamers and vessels are not yet counted. Those vessels, to the number of about 5,000 to 6,000, which are built for one journey, only down the rivers in spring time, are also not included.

According to the statistics of the Ministry of Ways of Communication the number of vessels, built annually in European Russia, is from 6,000 to 9,500, to the value of 2,000,000 to 3,225,000 dollars; this does not include the Caucasus, Finland, and Poland. The mean cost, taken during the last ten years, was 350 dollars per vessel. It may be remarked that the cost of construction increases considerably each year; thus, those vessels which in 1876 cost 250 dollars, were in 1886 quoted at 400 dollars; and at present cost 500 dollars. Moreover, statistics show that navigation and ship building tend to increase in proportion to the development of railways. Notwithstanding the increased cost of ship building, freights on inland waters continue to decrease every year. This is due to many causes, principally to the improvement of the water roads, the increased competition among the steam tug boats, improvement in the construction of these steamers, cheapness of fuel, and improved construction of the barges and sailing vessels.

Vessels, excepting steamers, are built on all river basins, principally where wood is cheap. For construction, a spot on a level, dry bank is chosen where the water will overflow in spring. Instead of a launch and blocks, frames are made of logs, and levelled to about four feet above the earth. A stage is built upon these, and the flat bottom of the vessel laid; frames are then set up, being fastened to the bottom with wooden pegs or iron pins, in the latter case the head of the pin being driven in from below, ribs are fitted to the frames, inside keels are placed at the prow and the stern, and staves put on. The pine wood for the sheathing is sawn damp, and chosen as long as possible. The stern and the prow are proportioned with

particular care, but everything is done by eye, without any drawings or special tools, the axe, chisel, plane, and saw constituting the whole stock in trade of the ship builder. When the sheathing reaches the height of the wash boards, cross beams are attached to the frames. The wood for them is chosen with a natural curvature; the beams are trimmed according to a pattern and, when quite levelled, the deck is laid upon them. When all the wood is sufficiently seasoned the caulking is commenced; this is done with hemp tow and rope ends.

The builder classes his carpenters according to their skill, and puts the best men on the most important parts of the ship. The caulkers are a special class, and pride themselves upon the conscientiousness of their work; and it may be said of them that they display much zeal in their slow, monotonous, and dull occupation. The carpenters often excuse their own imperfections with the phrase: «The caulkers will put it all right.»

After the caulking, the ship is plentifully smeared with hot tar, boiled to the consistency of sealing wax. Some boats, however, like the *belianka*, *unshaki*, and large barks, which are only built for one cruise, are not tarred. As little iron as possible is used in their construction, wood being used instead wherever possible, thereby, much impairing their solidity and increasing the yearly number of wrecks. About 250 or 300 of them are wrecked annually, by colliding with each other, or through knocking against the lock gates, banks or rafts, or else from injury done by the waves of the rivers, as slight shocks are sometimes sufficient to sink them.

The newly built boats are generally launched on the spring tides, which inundate the banks, and float the boats without any other means being required. If a launch has to be made in summer or autumn, a very simple contrivance is adopted. The vessels are built along side the river, and lowered into it broadside on. Some of the log frames under the bottom are knocked out, and replaced by a row of inclined beams. Round poles are laid upon the beams, and act as rollers under the ship. The other supports are then removed, and as soon as the vessel stands only on the round poles, she slides into the water of her own weight. By reversing this process the vessels may be docked for repairing, re-sheathing, caulking, and other purposes, if it is not possible to make use of rising waters. Windlasses and hawsers are generally used for hawling up the boats out of the water, but such docking is only applied to small vessels. Barges 140 feet long and upwards are generally towed to a place suitable for repairing in time of full water, and great care is taken that the lowering of the water may cause them to lie evenly on the ground, without the risk of distorting them. When the vessel is dry, it is raised upon a stage by means of levers and beams, and levelled by the eye. The construction of schooners, brigs, and other river and seakeeled boats, is further complicated by the preparation of frames from patterns. Oak with a natural curvature is generally selected for this purpose, and they are placed near together, so as not to spring the sheathing while caulking. The planks used for sheathing the curved parts are steamed in special boilers. Iron is more plentifully used, the durability and solidity of the vessel being proportional to the quantity and strength of its fastenings.

The work of building these boats is not left to common carpenters, but is entrusted to ship builders, conversant with drawings, lining out, ship-outfitting and rigging. The building of warships on the Black and Azov seas has much tended to

improve the construction of these kinds of vessels. Formerly sailors used to serve in the fleet twenty years and upwards, the more competent ones were attached to the Government wharves where wooden ships were built, and their skill was imparted to those engaged in building trading vessels.

The cost of the vessels cruising on the rivers and seas given by the Statistical Department of the Ministry of Ways of Communication as follows: brigs, carrying 125 to 450 tons, cost from 1,000 to 16,000 dollars; schooners, 50 to 230 tons burden, from 250 to 3,500 dollars; *trembaki*, of 35 to 175 tons burden, cost from 250 to 4,500 dollars; *dubas*, of 15 to 100 tons burden, cost from 75 to 2,250 dollars; and *kosovias* for the Caspian Sea, of 6 to 100 tons burden, cost from 50 to 750 dollars.

The total number of river vessels, excepting steamers, in European Russia, not counting Finland, the Caucasus, and Poland, together with the boats built for one season only, may be numbered at 20,000 with a tonnage of 7,000,000. The total cost is about 17,500,000 dollars. The number of men employed on them amounts to 95,000, each vessel containing from 3 to 65 men. Until steam tugs were used, some of the boats had crews of 200 men, and as many as 100 horses and 400 men were used for towing them. The number of vessels built abroad, exclusive of steamers, is as follows: for the Volga, 10 iron barges, some of which cost 42,500 dollars each; for the Dnieper, below the rapids, 101 vessels, of which 71 are iron barges; above the rapids, 12 *berlinas*; 437 vessels were built in Prussia for the Niemen, including 259 wooden *batas* which last 50 years and more; 29 iron barges were built abroad for the Don, and 540 galleys for the Dniester were built in Austria out of Carpathian wood. In all 1,130, distributed as follows: 610 vessels in Austria-Hungary, 440 in Prussia, 40 in England, 9 in Sweden, and 31 in various other countries; many of the iron boats were imported in pieces, and put together in Russia.

As many of the vessels are freighted two, three, or even more times in a season the mean number, taken during the last ten years, of vessels freighted in a year is 56,344, and 83,308 rafts of 25 million logs. As regards the rafts, it may be mentioned that the American plan of fastening them with iron clamps driven into the wood, and bound with iron rods and chains, is not adopted in Russia. Most rafts are fixed together with poles fitting into eyes cut in butt the ends of the timbers. By this means more than a foot length of the best thick end of the wood is ruined, and has to be used as fuel; besides this, the method is slow and entails the use of much small wood for wedges.

The numerous vessels of the fleet, which has been described, give abundant work for the woodsmen, raftsmen, carpenters, black smiths and others, but do not tend much to their further improvement; whilst those boats which are only built for short service are not in the least economical. It will be observed that the river steam fleet of European Russia has quite a different influence.

## RIVER STEAMERS.

The first steamer in Russia was built in 1813 by the ship builder Baird of St. Petersburg. In 1817 he applied for a patent, and was granted a monopoly until 1840. Five years after the expiration of the patent the Peterhov Harbour Company was formed. Four years later regular steamboat service and steam towing were

instituted on the Ladoga and Onega lakes; in 1852 there were 45 steamers, with an aggregate of 3,069 horse power, on the Neva basin.

Simultaneously with Baird in 1817 the iron master Vsevolozhsky constructed two steamers of 36 and 6 horse power, under his personal supervision at his own works at Povzhevsk on the Kama river. In the following spring the construction of a steamer with two engines of 16 horse power each was commenced. He was obliged to acquire the permission of Baird to be allowed to steam them; however, their trips on the Kama and Volga proved unsuccessful. The first two steamboats wintered on the Kama; their bottoms stuck to the bed of the river, and the spring waters submerged them; they were dismantled and the engines were used in the millwork. The third steamer reached Rybinsk, but returned to Povzha in a dismantled condition. In 1820 Mr. Evreinoff, with Mr Baird's sanction, ran five steamers on the Volga, 4 were of 16, and one, of 60 horse power. These boats used to ply from Nizhni to Rybinsk and Astrakhan. In 1826 Mr Shepelev built a steamer on the Oka for his private business. In 1836 an Englishman, Matthew Murray, built a trading steamer on the Oka.

In 1843, after the expiration of Baird's patent, the steamboat trade on the rivers of the Empire was open to all, and anybody was free to build boats. The Volga Steam Navigation Co. was founded in 1843, and has thus immortalized the date of the expiration of the monopoly. This society has flourished until the present day. The Perm Steam Navigation Company was then started, and afterwards the Nizhni-Novgorod Foundry and Ship Building Co. The profitable nature of the business brought forth private enterprise, and the iron works were greatly occupied in building steamers. In 1852 there were thirty steamers, with a total of 3,760 horse power, on the Caspian basin.

The first steamer on the Black Sea basin was built in 1823 at Moshny in the government of Kiev, on the estate of Prince Vorontsov; it was a steam tug for towing barks. Two years later this steamer was taken over the rapids of the Dnieper to Khersou. In 1846 Mr Maltzev's steamers began to ply on the Desna and Dnieper; then came a steamboat built by the landowner Puslovsky, followed by others. In 1852 there were seven steamers, with a total of 360 horse power, on the Black Sea basin. Steam service on the Dniester began in 1840, when the Government steamer «Prince Vorontsov» was used for towing vessels. In Archangel, on the Northern Dwina, steam navigation dates from 1848, and in 1852 there was only one 40 horse power steamboat there. In 1852 there were in all 148 steamers, on the navigable rivers, of European Russia. Those on the basin of the Baltic were for the most part passenger boats, whilst on the other basins steam tugs were mostly required. The boats cruising in 1852 were built in the following order:

|         |           |                           |              |
|---------|-----------|---------------------------|--------------|
| In 1825 | 1 steamer | in 1846                   | 17 steamers. |
| 1839    | 3 »       | 1847                      | 17 »         |
| 1840    | 9 »       | 1848                      | 12 »         |
| 1841    | 1 »       | 1849                      | 9 »          |
| 1842    | 6 »       | 1850                      | 27 »         |
| 1843    | 2 »       | 1851                      | 20 »         |
| 1844    | 7 »       | 1853                      | 16 »         |
| 1845    | 9 »       | <hr/> Total 148 steamers. |              |

After the year 1852, steamboats developed considerably, merchants acquired full confidence in them, capitalists invested largely in them, and realized good profits. Capstans were now used instead of horses, a windlass-apparatus was put up on the river Sheksna, and steam tugs completely replaced towing by men and horses. The steam tugs from Saratov to Rybinsk made five and even six journeys per season; freight fell to less than one-half; steamers were in great demand; the ironworks were overcharged with work; machine construction and iron rolling were developed and improved; skillful smiths, fitters, and engineers were turned out; and all this tended also to improve the construction of the wooden vessels to be towed.

From 1852 to 1869 the number of steamers grew to 623, with a total horse-power of 45,131; the boats being classed according to their horse power as follows.

| D A T E S.        | UNDER 50     | 50 TO 100    | ABOVE 100    |
|-------------------|--------------|--------------|--------------|
|                   | HORSE POWER. | HORSE POWER. | HORSE POWER. |
| S t e a m e r s . |              |              |              |
| 1860 . . . . .    | 170          | 148          | 74           |
| 1865 . . . . .    | 201          | 198          | 77           |
| 1869 . . . . .    | 221          | 276          | 126          |

The mean efficiency of a steamer on the Volga is shown by the statistics of the Ministry of Ways of Communication for 1869, as follows:

|  |                   |
|--|-------------------|
| 60 HP steamer tows 1 barge carrying 1,050 tons |                   |
| 80—120   | > > 2 > > 2,000 > |
| 150—200  | > > 3 > > 2,750 > |
| 250—450  | > > 4 > > 3,550 > |

One 30 to 40 horse-power capstan will pull 5,000 tons, and one 60 to 70 horse-power capstan, 8,000 tons.

The difference in the number of vessels falling to each steamer depends principally upon its speed. The steam tugs tow barges up stream on the Volga at the rate of 3.31 miles per hour, and the capstans do not give more than 1.65. If the latter consume less fuel it will be found that all this economy is used up by the steamer, which carries forward the anchor and then brings back the hawser to the capstan, which by this means propels the whole caravan. Besides this, as the hempen hawser is not less than 9 inches in circumference, it requires a good many spare hands to load it on the steamer. These ropes wear out very quickly, and rot in warm weather; they cost from 150 to 175 dollars per ton; a length of 3,500 feet weighs about fifteen tons, and therefore the usual hawser costs about 2,500 dollars. The long capstan caravans always meet with difficulties in the winding channel of the bends of the Volga, and also interfere with the progress of other vessels. They are now out of use, and their disappearance has brought about considerable improvement in ship building, as then no attention was paid to the prow,

midship, and curves of the vessels in tow, whilst the steamtugs always give preference to those which offer least resistance to the water.

From 1869 to 1879 the number of steamers did not increase very rapidly, but more regularly and in proportion to the requirements of increasing trade transport. In 1879 there were fifteen steamers, with a total of 925 horse power, cruising on the White Sea basin. They are all classed as passenger and goods-towing steamers; thirteen of them are iron, and two, wooden; two were built in St. Petersburg, two in Nizhni-Novgorod, five in Vologda, and six in Belgium. The first cost is put down as 269,175 dollars, or 291 dollars per horse power.

In 1879 the number of steamboats on the Baltic basin rose to 236; of these 54 were built in St. Petersburg, 48 in other parts of Russia, 25 in Finland and 109 abroad. At the same date there were 556 steamers on the waters of the Caspian Sea basin; of these 110 were passenger; freight passenger boats, 43; passenger tug boats, 21; tug boats, 342; chain cable boats, 24, and various, 16. At this time many steamers were already using naphtha fuel and it was also towed in barges in bulk. The new freights from central Asia, consisting of cotton, wool, hides, dry fruits, et cetera, also date from that time. In 1869 there were 54 steamers plying on the Azov Sea basin; 11 of them were constructed in Russia, and 43 abroad. There were 57 steamers cruising on the Black Sea basin; 9, below the rapids of the Dniester, and 48 above; 14 were built in Russia, and 43 abroad.

The total number of steamers plying on the inland waters of European Russia in 1879 was 918, and the building of their iron hulls, and also that of their machinery, became established on a firm footing in Russia. Engineering works were enlarged and the demand for machines increased, both for railways and river steamers. Great assistance in propagating knowledge and skill was afforded by special technical and mechanical institutions, and also by the war fleet, which inculcated into Russia the art of building iron and steel ships of war with all their machinery and armament. It is necessary to observe that up to the Crimean war the art of ship building was centralized in the war fleet; it seemed almost locked up, and only penetrated into the outside world by the agency of retired seamen. There were 20 working crews engaged in Government ship-building works on the White, Baltic, and Black seas. After the war, from the year 1860, the building department of the Marine commenced dispensing with Crown labour; in this manner 10 companies of soldier workmen were discharged, and the way was laid for private orders. By 1890 all the remaining working crews were done away with, and permanent gangs of artisans were organized as free men working for wages. Then the more special, arsenal, cartridge, and firework factories, as well as the workshops of the War and Naval departments, adopted hired labour, and greatly assisted in developing metallic industry and machine construction in Russia.

The further progress of steamship building may be followed by consulting the work of the Statistical Department of the Ministry of Ways of Communication. There was an account published towards the end of 1886, entitled «The River Steamer Fleet of European Russia according to the Census of 1884». In this list the merchant fleet includes 1,246 steamers with a total of 72,105 nominal horse power, and 6,099,581 pounds displacement, costing 48,896,050 roubles, and manned by 18,766 men. The cost of the steamers, reduced to an average by the Statistical Department, amounts to 650 roubles (325 dollars) per nominal horse power, and 582 roubles (291 dollars) per ton displacement.

Taking each type of vessel separately, the mean prime cost of the steamers is as follows:

|                         |                                     |
|-------------------------|-------------------------------------|
| Passenger boats . . .   | 853 roubles per HP, and 877 per ton |
| Freight passenger boats | 898 > > HP, > 644 >                 |
| Tug boats . . . . .     | 564 > > HP, > 563 >                 |

It is to be regretted that the information is wanting for former years, which would show the difference in the cost of building steamers at home and abroad, and also the relative prices for past and present years.

The fuel used on the steamers is also given in this account. The consumption during the navigation of 1884 was:

|                         |                                 |
|-------------------------|---------------------------------|
| On 562 steamers . . . . | 276,911 cubic fathoms of wood.  |
| > 422 > . . . .         | 162,880 tons of coal.           |
| > 261 > . . . .         | 219,725 tons of naphtha refuse. |
| > 1 > . . . .           | 712 tons of peat.               |

The coal was distributed thus: 32 per cent on the Neva basin, 5 per cent on the Northern Dvina basin, 10 per cent on that of the Dnieper, 19 per cent on that of the Don, and 37 per cent on the remaining basins. The Volga steamers were fed with naphtha refuse. Coal was used on the Dnieper only below the rapids. By distributing the fuel according to the class of steamer the following results are obtained:

|                |               |                       |          |                      |
|----------------|---------------|-----------------------|----------|----------------------|
| Wood fuel . .  | 70 passenger, | 55 freight passenger, | 391 tug, | 27 chain cable boats |
| Coal . . . .   | 61 >          | 36 >                  | 188 >    | — >                  |
| Naphtha refuse | 13 >          | 44 >                  | 215 >    | — >                  |

The steamers are from 10 to 170 tons displacement, the majority of them carry from 35 to 90 tons freight. They are from 10 to 200, or more, nominal horse power; only 6 steamers are over 200 horse power. There are 160 steamers having from 100 to 200 indicated horse power; 17 with more than 600 horse power indicated; one tug boat on the Volga of 1,000, and 2 freight-passenger Volga steamers, of the American Mississippi type, of 1,500 horse power. According to the type of motors 810 are paddle steamers, 231 screw steamers, and 27 are chain-cable drawing boats.

From 1885 to 1890, 578 steamers were added on the inland waters of European Russia, and by January 1, 1891, there were 1,824 steam vessels afloat. The census of vessels is taken by the Statistical Department of the Ministry of Ways of Communication every five years; as the census of vessels which are always changing their position, or else passing from one owner to another, is a most complicated and difficult matter, a published list of them is not as yet available. It must be observed that there are not as yet in Russia any private statistics of navigation, either for scientific purposes, or for insurance and classification, like Lloyds or Veritas.



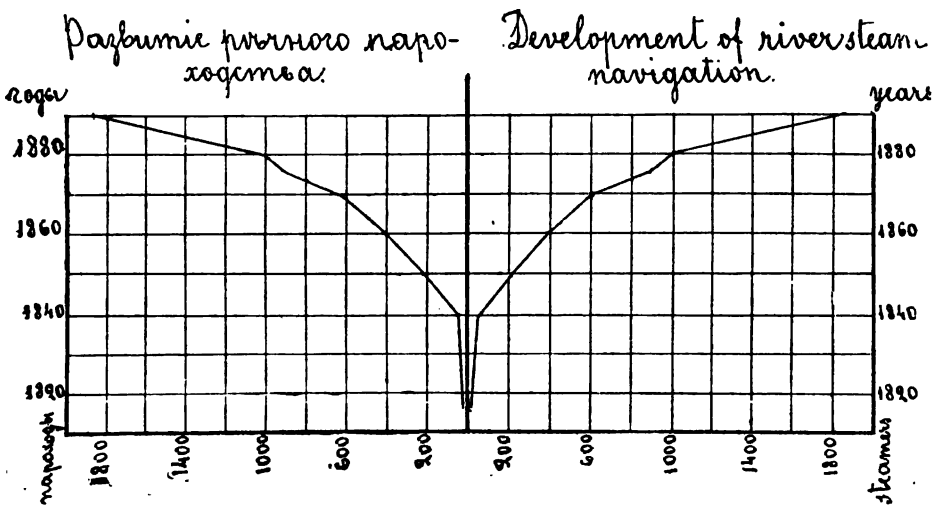
The list of steamers published by the Ministry in 1885 shows the type of vessel, horse power, dimensions, capacity, type of motor, material of which the vessel is built, kind of fuel used, date when the hull, engines, and boiler were constructed, where they were built, and finally the name of the owner. In order to follow the progress of steamship building in Russia, a table of steamers afloat, according to the census of 1885, is annexed.

| RIVER BASINS.            | S T E A M E R S B U I L T. |             |             |             |            |          |          |         |          |          |
|--------------------------|----------------------------|-------------|-------------|-------------|------------|----------|----------|---------|----------|----------|
|                          | In all.                    | Dates.      |             |             | In Russia. |          |          | Abroad. |          |          |
|                          |                            | Up to 1850. | Up to 1870. | Up to 1885. | Hull.      | Engines. | Boilers. | Hull.   | Engines. | Boilers. |
| Vistula . . . . .        | 23                         | 1           | 1           | 21          | 4          | —        | —        | 19      | 23       | 23       |
| Niemen . . . . .         | 14                         | —           | 4           | 10          | —          | 2        | —        | 14      | 12       | 14       |
| Western Dwina . . . . .  | 42                         | 1           | 10          | 31          | 13         | 16       | 18       | 29      | 26       | 24       |
| Dniester . . . . .       | 5                          | —           | 1           | 4           | 1          | 1        | 1        | 4       | 4        | 4        |
| Dnieper . . . . .        | 144                        | 6           | 35          | 103         | 34         | 28       | 54       | 110     | 116      | 90       |
| Don . . . . .            | 97                         | 1           | 33          | 68          | 13         | 12       | 22       | 84      | 85       | 75       |
| Narova . . . . .         | 14                         | —           | 4           | 10          | 12         | 12       | 12       | 2       | 2        | 2        |
| Neva . . . . .           | 200                        | 4           | 81          | 115         | 107        | 109      | 120      | 93      | 91       | 80       |
| Northern Dwina . . . . . | 69                         | 3           | 18          | 48          | 35         | 24       | 26       | 34      | 45       | 43       |
| Volga . . . . .          | 761                        | 6           | 304         | 451         | 580        | 550      | 595      | 181     | 211      | 166      |
| Total . . . . .          | 1369                       | 22          | 391         | 856         | 799        | 754      | 848      | 570     | 615      | 521      |

Amongst the firms which constructed steamers, engines, and boilers for the Volga basin, the following may be mentioned: Shipov in Kostroma, Zhouravlev in Rybinsk, Benardaki in Sormova, Haks in Kungoura, Motovilikhinski in Perm, Shepelev on the Vyksa, Vsevolozhsky on the Povzha, Milutin in Cherepovet, Strouve in Kolomna, and many others which spring up as steam navigation progresses. Besides this, many steamship owners build their own hulls, boilers, and even engines themselves, under the superintendence of practical engineers and naval officers. And, although the steel and iron vessels of this basin are built of materials which come from the Urals, where they are worked in limited quantities, the trade continues to increase. Its progress gives great hopes for the future, and this is borne out by the number of buildings which are being erected and the large sums expended for steam hammers, planing and drilling machines, and all other costly workshop appliances.

Although as yet no statistics have been published about the present state of river steam navigation in European Russia, yet the total number of steamers up to 1890 amounted to 1,824, and the following table may be compiled from the former data.

| Steamers. | NOMINAL HORSE POWER. |       | BURDEN.                                    |                  | C O S T.               |                  | MEAN COST.       |               | C R E W.       |            |
|-----------|----------------------|-------|--|------------------|------------------------|------------------|------------------|---------------|----------------|------------|
|           | Total.               | Mean. | Total.                                     | Mean.            | Total.                 | Mean.            | Per horse power. | Per ton.      | Total.         | Mean.      |
| 1,824 . . | 104,000              | 57    | 7,660,000<br>pouids.<br>(128,000<br>tons). | 4,200<br>pouids. | 72,960,000<br>roubles. | 40,000<br>roubl. | 700<br>roubl.    | 570<br>roubl. | 27,360<br>men. | 15<br>men. |



THE MERCHANT SEA FLEET.

The vessels of the Russian merchant sea fleet have such a remote history, that even a short summary of the incidents would occupy far too much space to be within the scope of the present article. It is therefore only advisable to deal with its present, especially as much has been written in all languages about the fleets of all nations. Information about the Russian Merchant Navy is concentrated in the statistical section of the Customhouse Department. As all vessels of the external ports are subject to certain dues, a list of the vessels of the Russian fleet was published by order of the Department of Trade and Manufactures in 1890 and kept with the exactitude fitting to the monetary transactions of the Customhouse. The published list represents the true, but as yet incomplete, state of this fleet at present. It registers all vessels over 50 tons capacity. A corresponding column shows the signals, and to facilitate international intercourse this list is translated into English. Up to January 1, 1892, the condition of the Russian merchant navy was shown to be as follows:

|   |         |
|---|---------|
| Sailing vessels on foreign seas . . . . . | 2,870   |
| Their capacity in tons . . . . .          | 240,030 |
| Number built in Russia. . . . .           | 2,418   |
| >   >   > abroad. . . . .                 | 391     |
| Unknown where . . . . .                   | 61      |

## When built:

|                                |       |
|--------------------------------|-------|
| Before 1870. . . . .           | 1,106 |
| Between 1870 and 1880. . . . . | 1,044 |
| After 1880 . . . . .           | 613   |
| Unknown when. . . . .          | 107   |

## Capacity:

|                                  |       |
|----------------------------------|-------|
| Below 50 tons . . . . .          | 1,279 |
| Between 50 and 100 tons. . . . . | 924   |
| > 100 > 200 > . . . . .          | 397   |
| Above 200 tons. . . . .          | 264   |

## Registered to ports of following seas:

|                          |              |              |          |                     |
|--------------------------|--------------|--------------|----------|---------------------|
| White Sea . . . . .      | 460 vessels, | 23,964 tons, | 52 tons, | average per vessel. |
| Baltic Sea . . . . .     | 629 >        | 84,939 >     | 135 >    | >                   |
| Black and Azov . . . . . | 1,131 >      | 131,137 >    | 116 >    | >                   |

As the sailing fleet consists almost entirely of wooden vessels, they are built in those places where wood is abundant. The whole of the White Sea fleet, with the exception of 10, was built in Russia. Out of the Baltic Sea fleet 49 vessels were built abroad. As the Black and Azov seas are adjacent to the steppes, 332 vessels of their fleet were built abroad. When the war fleet was composed of wooden vessels, Government ship building rendered great assistance towards building sailing vessels on all seas. Navigation classes were also opened in many seaport towns in which the theory of shipbuilding was taught, and competent teachers practically taught the design of ships, their armament, cordages, et cetera.

Small sailing vessels are generally built on the shores of rivers and seas in temporary or casual slips. The larger vessels are built on ship-building wharves provided with covered places for the smith's shop and detail work; but for putting the ship together, and launching, it is not deemed necessary to sink capital in covered wharves, and so this work is almost always carried on in the open air. The cost of building sailing vessels amounts to 50 to 100 roubles (25 to 50 dollars) per ton displacement when fully loaded. The price and longevity of the vessels depends upon careful selection of the wood for the oak frames, the quantity of iron, the solidity of the fastenings, the thickness of the sheathing, the chains, anchors, et cetera. The life of a wooden vessel, plying on the open sea, is from 20 to 35 years.

The statistical section of the Custom house Department keeps a separate account of the Caspian Sea merchant fleet. Up to January 1, 1889, it comprised 1,131 sailing vessels, with a total capacity of 70,708 tons. Of these 1,091 were built in Russia, 1 abroad, and 34 not known where. These vessels are of various types schooners, brigs, barges, sea-going barges, and shallops. Their capacity varies from

50 to 600 tons, the average capacity being 62 tons. These vessels are either built on the banks of the rivers of the Caspian basin, or else on the shores of the Caspian Sea. The foreign vessel reaches the Caspian Sea through the Mariinsk system which connects that sea with the Gulf of Finland.

The activity of the whole sailing fleet of European Russia may be expressed by the number of arrivals in port during the year 1891 as follows:

|                          |              |               |
|--------------------------|--------------|---------------|
| Voyages abroad . . . .   | 733 vessels. | 124,692 tons. |
| Coasting cruises . . . . | 10,054 »     | 706,226 »     |

The number of vessels and tonnage cruising on each separate sea is shown in the annexed table.

|  | VESSELS. | TOTAL TON-<br>NAGE. | MEAN TON-<br>NAGE. |
|--|----------|---------------------|--------------------|
| White Sea, outward bound. . . . .      | 241      | 14,763              | 61                 |
| » coasting. . . . .                    | 436      | 22,652              | 52                 |
| Baltic Sea, outward bound. . . . .     | 433      | 106,054             | 242                |
| » coasting. . . . .                    | 2,516    | 131,764             | 72                 |
| Black and Azov, outward bound. . . . . | 54       | 4,876               | 90                 |
| « coasting. . . . .                    | 7,102    | 501,310             | 71                 |
| Caspian Sea, coasting. . . . .         | 5,276    | 1,216,364           | 250                |

This table shows that the ships on the White Sea only make one voyage during the short navigation season. They are almost all engaged in the fishing trade, and are not used for carrying freights. The Baltic Sea vessels accomplish a voyage and a half per season; here the sailing vessels are disappearing and making way for steamers and services of steamers, much to the advance of trade, commerce, and the inhabitants of the shore. On the Black and Azov seas, where the navigation season is longer, the vessels make four voyages. The activity on the shores of these seas is growing fast; and it seems strange that capitalists shrink from investing money in building steamers for the coasting trade, which is only permitted by law under the Russian flag. The sailing vessels on the Caspian Sea are able to make eight voyages; their chief freights are: naphtha and its products, timber from the Volga, and cotton from Central Asia to the Volga.

The steam merchant fleet on the external seas of European Russia up to January 1, 1892, consisted of the following:

|                    | Vessels. | Tonnage. | Horse power. |
|--------------------|----------|----------|--------------|
| White Sea . . . .  | 20       | 2,748    | 1,129        |
| Baltic Sea . . . . | 92       | 19,776   | 6,558        |
| Black and Azov . . | 249      | 84,559   | 21,721       |
| Total . . . . .    | 361      | 106,813  | 29,408       |

Of these, 51 were built in Russia, 304 abroad, and 6 unknown. Sebastopol takes the lead in steam ship-building with 13 steamers, next comes Riga with 11, then Rostov-on-Don with 10 steamers, Odessa 5, Kalach 4, Nicolaev 4, Kherson 3, St. Petersburg 2, and the government of Archangel 2, one of which was built by the works on the Solovetsk islands. After the introduction of the metallurgical industry into the south of Russia, that is, dating from 1887, at Rostov-on-Don 4 steamers were built, in Kherson 2, in Nicolaev 2, in Kalach 1; in 1890 one wooden tug boat, of 46 tons register, was built in Odessa. It is evident that in the south of Russia, where coal, iron, rivers, and sea lie side by side, ship-building will make great progress. The oldest steamer built abroad is the «Maimak» a tug boat of 67 tons register made of wood; she was built in England in 1837, and is still doing good service.

| Burden.            |               | Nominal horse power. |               |
|--------------------|---------------|----------------------|---------------|
| Under 100 tons . . | 153 steamers. | Under 50 HP . .      | 141 steamers. |
| » 500 » . .        | 150 »         | » 100 » . .          | 134 »         |
| » 1000 » . .       | 35 »          | » 200 » . .          | 44 »          |
| Above 1000 » . .   | 22 »          | Above 200 » . .      | 25 »          |
| Unknown . . . . .  | 1 »           | Unknown . . . . .    | 17 »          |

The activity of the foreign trade of the 361 steamers, afloat on the open seas in 1891, is expressed by 654 arrivals, with 486,180 tons import freight, to all the Russian ports. In the coasting trade these 361 vessels showed 18,653 arrivals, with 8,000,678 registered tons freight. This was distributed among the separate seas according to the following table.

|                         | FOREIGN.   |                | COASTING.     |                  | TOTAL.        |                  |
|-------------------------|------------|----------------|---------------|------------------|---------------|------------------|
|                         | Vessels.   | Tons.          | Vessels       | Tons.            | Vessels.      | Tons.            |
| White Sea . . . . .     | 12         | 5,508          | 212           | 51,452           | 224           | 56,960           |
| Baltic . . . . .        | 290        | 119,314        | 1,749         | 415,282          | 2,039         | 534,596          |
| Black and Azov. . . . . | 352        | 861,358        | 16,692        | 7,533,944        | 17,044        | 7,895,302        |
| <b>Total . . .</b>      | <b>654</b> | <b>486,180</b> | <b>18,653</b> | <b>8,000,678</b> | <b>19,307</b> | <b>8,486,858</b> |

This table shows that each steamer has on the average made 53 cruises in one season, and carried an amount of freight equal to 80 times its own capacity. This excessive activity of the steam fleet, principally in coasting voyages, clearly shows that the commercial development in Russia has exceeded that of ship building. The classification according to separate seas demonstrates this fact still more clearly.

|                        | ENTERED. |        | ARRIVALS. |           | NUMBER OF CRUISES.    |                       |
|------------------------|----------|--------|-----------|-----------|-----------------------|-----------------------|
|                        | Vessels. | Tons.  | Vessels.  | Tons.     | According to vessels. | According to tonnage. |
| White Sea. . . . .     | 20       | 2,478  | 224       | 57,960    | 11                    | 23                    |
| Baltic Sea. . . . .    | 92       | 19,776 | 2,039     | 534,596   | 22                    | 27                    |
| Black and Azov . . . . | 249      | 84,559 | 17,044    | 7,895,302 | 69                    | 93                    |

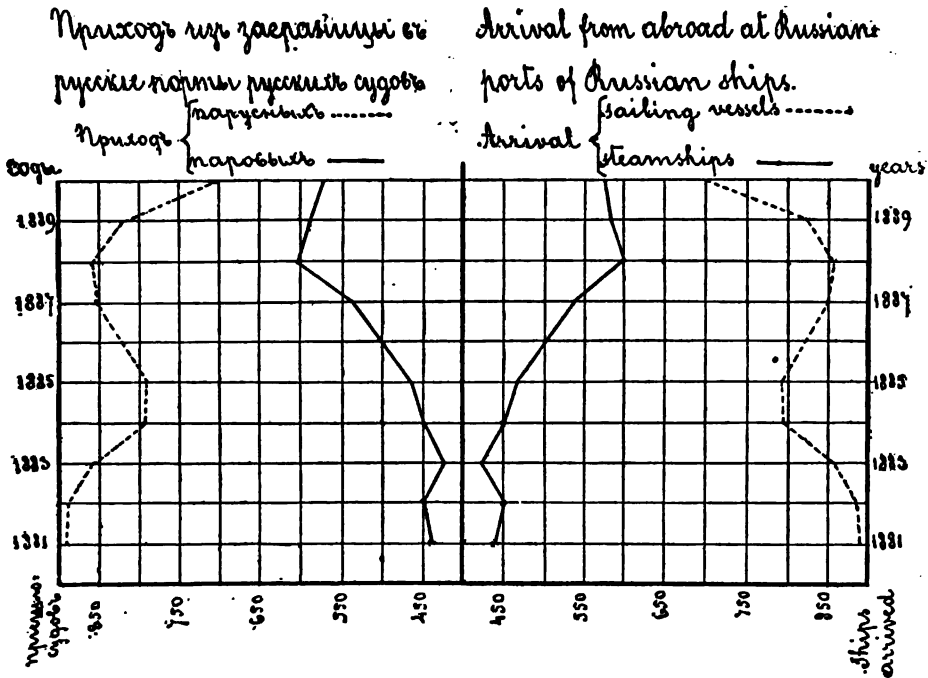


Diagram № 2.

Showing arrivals in Russian ports of Russian vessels from abroad; the vertical line showing the dates, and the horizontal line the number of ships; the sailing ships are designated by a dotted line and the steamers by a continuous line.

Hence, in the Black and Azov seas, each vessel made 69 cruises and carried 93 times its registered tonnage. Notwithstanding this great success, ship building advances much too slowly, and the transport trade on these seas is as yet nothing compared to what it will be. It must be borne in mind that the Caucasus was only conquered twenty-eight years ago, that railways have only been in general use about twenty years, coal mines have been in work for about fifteen years, metallurgical industry was only started some five years ago, and that the colonization of the Caucasus

and the region beyond the Caspian, and the road making there, has hardly been commenced. In spite of all this stimulus to create a merchant navy for foreign and coasting trade, the lack of capitalists makes money scarce for maritime business, and many are loth to take the risks of embarking in it; the high price of iron and steel for ship building and machine construction is also a serious obstacle.

It can be seen at once that the Caspian Sea fleet was the outcome of the petroleum trade, and has increased in proportion to it. The total number of steamers on the Caspian Sea was registered as 141; up to January 1, 1892, 16 were from various causes struck out so that at present there are 125, with a total tonnage of 48,842 registered tons: This comprises:

|   |     |
|---|-----|
| Wooden steamers . . . . .                 | 1   |
| Iron and steel steamers . . . . .         | 124 |
| Of these were built before 1870 . . . . . | 25  |
| From 1870 to 1880 . . . . .               | 21  |
| Since 1880 . . . . .                      | 71  |
| Date unknown . . . . .                    | 8   |

If classified according to tonnage it will be found that:

|  |    |
|--|----|
| Of those below 100 tons there were . . . . . | 19 |
| From 100 to 500 » » » . . . . .              | 68 |
| From 500 » 1,000 » » » . . . . .             | 36 |
| Above 1,000 » » » . . . . .                  | 2  |
| Of those built abroad » » » . . . . .        | 72 |
| Of » » in Russia » » » . . . . .             | 54 |

Of those constructed in foreign countries, forty-six were built in Sweden, forty in England, and one in Belgium. Those steamboats less than 150 feet long were conveyed from the Baltic Sea to the Caspian through the locks of the Mariinsk system. The longer ones were transported along the Volga in sections; and since 1880 a special type of steamer built in two sections has been made, each length being conveyed separately through all the locks, and then joined together in the Sheksna or Volga.

Fifty-four sea-going steamers have been built in Russia, of which fifteen came from Finland, and two from St. Petersburg; so that only thirty-seven were built on the Volga basin, and out of Ural iron. This small share of the Russian iron works towards ship building is due to the fact that, simultaneously with the increase of the Caspian Sea steam fleet, the iron works of the Ural were greatly engaged with railway work, and in building river steamboats. The Ural iron also, being smelted with charcoal, was unable to supply the demand for it and rose in price, so that the ship-

owners were obliged to place their orders abroad, where they also obtained easier terms.

The Sormovsk Works, belonging to the heirs of Mr. D. E. Benardaki, took the most active part among the Russian ship building firms. Their works are situated on the Volga about 7 versts above Nizhni-Novgorod, but even they have only built twelve steamers for the Caspian Sea since 1872. The other works have built respectively: Spassky-Zaton, 5 steamers; Astrakhan, 4; Kolomna and Balakhna, 3 boats each; Perm, Kostroma, Rybinsk, and Lubimovsk works, 2 boats each; Tsaritsin and the Votkinsk works, one boat apiece.

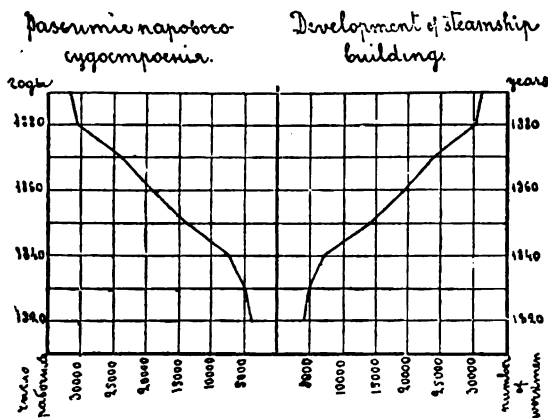


Diagram № 3.

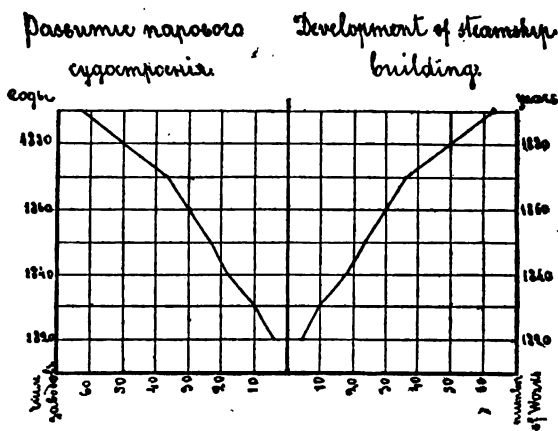


Diagram № 4.

Diagrams, Nos. 3 and 4, show «The growth of steamship building»; No. 4, according to the number of iron works. The vertical line represents dates, and the



horizontal line the number of ship-building yards and foundries which sprang up. № 3 represents the same, with reference to the number of workmen, the dates being in a vertical line; and the total number of hands employed in all the yards and works are shown in a horizontal line.

The activity of the 125 steam vessels of the Caspian Sea in 1890 is expressed by 5,876 arrivals to all ports, with a total tonnage of 1,374,004, so that each steamer made 49 cruises during the season. The mean capacity of a steamer being 391 registered tons, each of them transported 28 times this quantity, or 11,450 tons. Almost all the petroleum steamers travel from Astrakhan to Baku without freight.

The future of the Caspian fleet is very encouraging, first, on account of the steadily increasing trade in petroleum in the Caucasus, and second, on account of the impetus given to Central Asia through Russian colonization and the railway line to Samarkand. The steamboat traffic on the Caspian has also done good service in completely suppressing piracy, and raids on the peaceable traders for the purpose of selling them as slaves. The raids of the Asiatics were made with light boats, which easily escaped from the sailing war cruisers over the shallows and sand banks. The Caspian fleet will also prove a powerful means of civilizing the semi-barbarous regions of Asia.

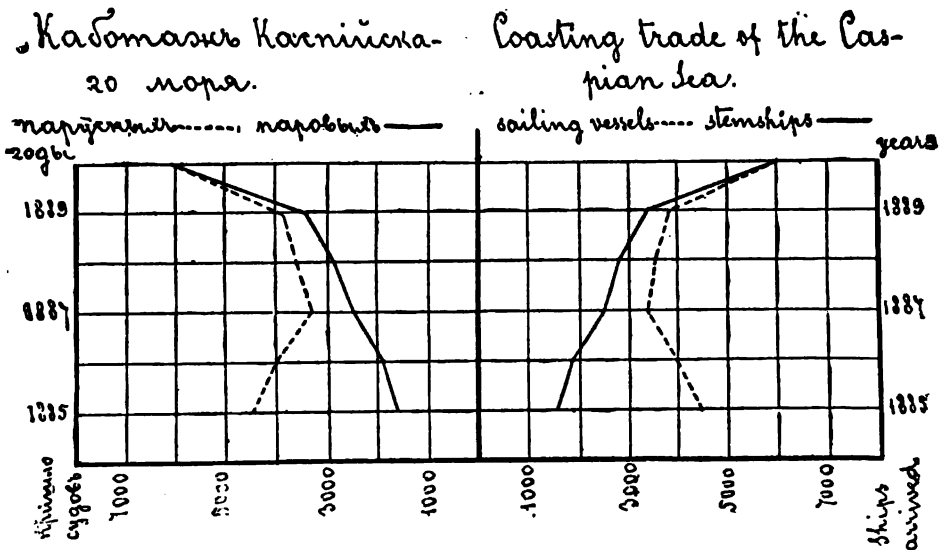


Diagram № 5.

«The coasting trade on the Caspian Sea»; dates shown in vertical lines, and the arrivals of vessels in horizontal lines; dotted lines signify sailing vessels, and continuous lines, steamers.

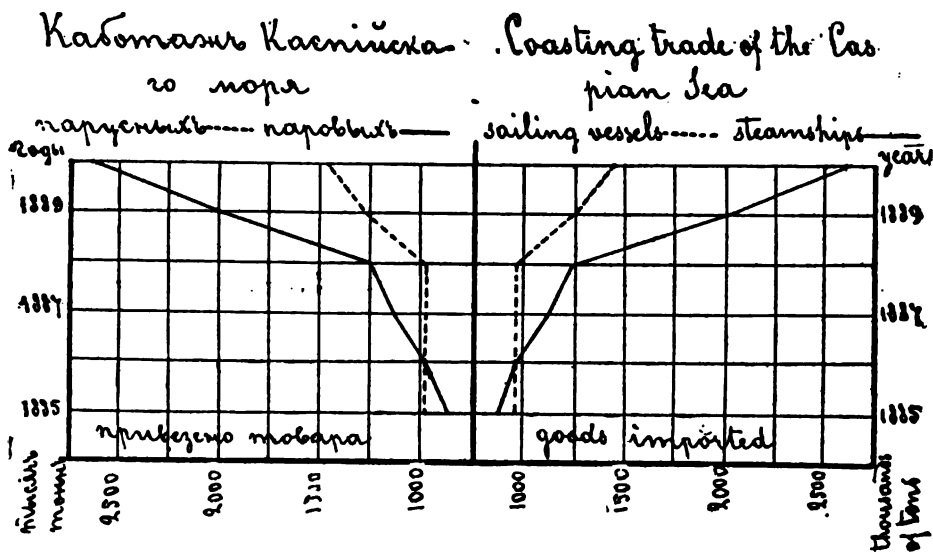


Diagram № 6.

«The coasting trade on the Caspian Sea»; vertical lines showing dates, and horizontal lines import of goods; dotted lines refer to sailing vessels, and continuous lines, to steamers.

### THE MERCHANT FLEET OF FINLAND.

Thanks to the position of Finland, its shipping and ship-building trades were developed at an early date. In an area of 144,242 square miles of this portion of the Russian Empire there is a surface of 18,560 square miles of lakes. The seashore is indented by gulfs and surrounded with islands, whilst the inland lakes are connected by many full rivers. It is a country created for navigation; and by the indefatigable energy of its inhabitants the lakes have been connected with the seas by canals, and the whole country, even to the most remote corners, covered with a network of water ways. The country abounds in fir woods suitable for ship building, is rich in bog and lake ores, for producing iron and steel for steamers and engines, and the people have a great taste for the sea.

There are 9,300 vessels with 1,391,240 tons of merchandise which leave the Finnish ports every year. From 15,000 to 18,000 vessels ply along the canals for inland cruising.

The following table shows the capacity of the sea-going ships:

| V E S S E L S.    | UNDER 200 TONS. | UNDER 400 TONS. | UNDER 600 TONS. | ABOVE 600 TONS. | TOTAL. |
|-------------------|-----------------|-----------------|-----------------|-----------------|--------|
| Steam . . . . .   | 290             | 18              | 2               | 2               | 312    |
| Sailing . . . . . | 1,398           | 269             | 79              | 50              | 1,796  |

Notwithstanding their small size, these ships make voyages to England, France, Spain, Brazil, and the United States. The fleet visibly increases, and the sphere of its action greatly enlarges; from 1879 to 1889 it increased 67 per cent in number and tonnage. The exports of Finland are timber, tar, cast-iron, wrought-iron, cattle, salt and fresh fish, butter, cheese, birds, game, and finally about 3,500,000 live crawfish for Berlin. The imports are wheat, salt, sugar, coffee, tobacco, wine, fabrics, and hardware. The country feels that there is no need to spare expense in developing the shipping trade. In this small corner of the Empire there are seven navigation schools, which prepare captains, pilots, masters, and mates. Besides this, there are five technical schools for teaching ship building and machine construction, and for preparing engineers. There is a special corps of pilots for safe cruising along the shores of Finland, which are full of narrow channels between rocky islands, and thickly strewn with sunken rocks; 120 pilot stations have been disposed, 109 lighthouses are in use; 4 salvage points have been arranged, and the principal channels have been marked out with beacons and buoys; 943 men are employed, who pilot 12,000 sea boats a year; and thanks to all these precautions not more than 30 vessels per annum are wrecked.

#### THE BUILDING OF WARSHIPS.

This sketch would not be in any degree complete without touching upon the construction of warships. During the last twenty years there has not been in any branch of enterprise so many discoveries as in naval architecture. All kinds of scientific inventions have been applied, all nations have competed for what was newest and best. The whole world, at the expense of hundreds of millions upon experiments and alterations, has transformed ships of war into floating mechanical appliances of an unsinkable and impenetrable nature, and the treacherous ocean has become the best and cheapest means of international communication. In Western Europe and in the United States, the ship building of the merchant navy is in advance of that of the fleet; but in Russia it is the reverse; the war fleet, representing the force of intelligence and initiative in marine affairs, was in front of the private enterprise which followed in the rear, making use of the results attained by the Government.

The geographical position of Russia renders it necessary to maintain four fleets on different seas, and these fleets have always been schools of regular ship building. When the war vessels were built of wood, private ship builders adopted the method of selecting and classing timber practised by the Government naval architects, and also used the same terminology, and acquired in this way so much skill that their ships were not inferior to those of other nations. When the wooden sailing vessels gave place to iron steamers, the Imperial fleet was the means of raising the metallurgical industry in Russia, placing it on a level with that of other countries, and in this way did away with the necessity of ordering the ships to be built abroad. The private enterprise of the iron masters and ship builders quickly responded to the demands of the Government; capital was disbursed, large orders received,

engineering skill improved, and a class of intelligent builders and artisans sprang up. The fleet had also a powerful moral influence upon the merchant navy. The short term of military service introduced in 1873 had the effect of spreading knowledge, order, and discipline. It also prepares seamen, stokers, oilers and engineers. These men, after serving their time, diffuse their knowledge and orderly habits into the merchant navy, serving as an example to their new comrades, and in their turn formed a new set of active recruits for the fleet. The studies and investigations of specialists (naval officers) in the application of galvanism, electricity, torpedo work and mechanical contrivances of all kinds, have done much towards the propagation and advancement of science. It may be said that the fleet has been entirely reformed within the last generation, so calmly, firmly, and completely, that the unbiassed observer may contemplate the future of the Russian nation with astonishment.

The Naval Administration in 1856 worked out the project for the Black Sea Navigation and Trading Company, and raised it to such a condition that the large steamers of that Company make regular trips, not only in the Black and Mediterranean seas, but also between the ports of India, China and other distant countries, thus showing an example of the development of the Russian trade fleet for long voyages. The importance of the Caspian Sea was appreciated almost at the same time, when after the Crimean war it became a question of sinking the whole of the Black Sea fleet, and the Caucasus was quite cut off from the rest of Russia by Sea. The Caucasus and Mercury Joint Stock Company was then organized. In the event of a blockade of the Black Sea, this company was able to supply the regions beyond the Caucasus with troops, provender and Government stores, and have a general influence upon Persia and the Turcoman steppes. Moreover, the Ministry of Marine conducts hydrographic work on all the adjacent seas, publishes maps of all parts of the world, and maintains all the lighthouses.

This same Ministry, with the object of acquainting the inhabitants of the continent of Russia with the importance of its marine business, took the lead in the private enterprise of organizing the polytechnic exhibition of 1872 in Moscow, held in commemoration of the two-hundredth anniversary of the birth of Peter the Great. It was here that the idea of instituting the «Society for the Assistance of Russian Trade Navigation» originated, which strengthens the bond between trade, industry, and navigation. It is under the exalted protection of members of the Imperial family; it has founded schools of seamanship, propagated practical knowledge of navigation, and finally taken upon itself the initiative in the organization of a volunteer fleet. A subscription equivalent to 2,000,000 dollars was raised; and during the ten years existence of this fleet, regular voyages of Russian ships to the shores of the Pacific Ocean have been started, and on their return voyages these vessels import a very considerable quantity of Chinese tea into Russia. At present this fleet, besides its huge transport ships, possesses three swift steamers, always ready to be used as auxilliary vessels for the ocean war fleet.

Until the Crimean war, the Russian fleet, distributed upon the White, Baltic, Black, and Okhotsk seas, was almost entirely composed of wooden sailing vessels. As regards power, speed, and sailing qualities these ships were very efficient. The fleet consisted as follows:

|  |     |
|--|-----|
| Line-of-battle ships . . . . .                                     | 40  |
| Frigates . . . . .   | 40  |
| Corvettes, brigs, schooners, tugs, yachts, and<br>tenders. . . . . | 61  |
| Various other vessels . . . . .                                    | 45  |
| Pilot and loading boats . . . . .                                  | 42  |
| Transports . . . . .   | 76  |
| Row boats . . . . .  | 105 |
| Total . . . . .  | 409 |

These ships carried 5,453 guns. At that time the steam fleet was regarded as a sort of auxiliary to the sailing fleet, and before the war of 1853, it was constituted as follows:

|  |    |
|--|----|
| Steam frigates, completed . . . . .            | 16 |
| Small steamers,        > . . . . .             | 36 |
| Screw transports, under construction . . . . . | 3  |
| Screw frigates . . . . .                       | 3  |
| Screw corvettes . . . . .                      | 2  |
| Screw steamers . . . . .                       | 2  |
| Total . . . . .                                | 62 |

This fleet carried 202 guns, with a total of 11,470 horse power. Moreover, there were also eight small steamboats, with sixteen guns, on the Caspian Sea.

The first paddle-boat of the naval department was the *Skory*, («The Swift»), built in 1817 at the Iron Works of Izhora near St. Petersburg. It was used for harbour duty, and was 60 feet long, 14 $\frac{1}{2}$  feet wide with a draught of 7 feet; it had a 30 horse-power engine, and lasted twenty-two years. From 1817 to 1840 twenty-three steamers, having from 15 to 140 nominal horse-power, were built for the Baltic fleet. Eight of these were made abroad, two at private Russian works, and thirteen at the Government wharves in St. Petersburg. Between 1840 and 1850 eleven steam frigates, with 200 to 540 nominal horse power engines, were built; of these the *Kamchatka* was built in New York, the *Vladimir* in Liverpool, and the remainder in St. Petersburg. The first steamer of the Black Sea fleet, the *Vesuvius* was built in 1820 at Nikolaev; she was 94 feet long, 20 feet wide, and drew 9 feet of water. From 1820 to 1853 thirteen steamers for the Black Sea were built at Nikolaev, and twenty-six in England, including seven steam frigates with 260 to 400 horse power engines. The first 40 horse power, steamboat for the Caspian Sea was built in 1828 at the Government admiralty of Astrakhan. From that time till 1853 ten more steamers, of 40 to 100 nominal horse power, were constructed. Four of these were made of wood at Astrakhan, two of iron at the Votkinsk works near the Kama river, three in England, and one in Holland, and which was brought over in sections.

During the hard time of the Crimean war, the country ceased to depend upon

foreign firms for building Men of War and began to develop its own Governmental and private works. In two years seventy-five screw gunboats, and fourteen corvettes, were built and supplied with Russian engines, the materials used being larch, pine, and oak. Each boat cost on the average 10,000 dollars. The engines were high pressure, 50 to 75 nominal horse power, made at Government and private foundries at a cost of 9,458 dollars each. Fourteen corvettes of 200 nominal horse power, carrying eleven guns each, were built in St. Petersburg by Government and private firms, of the same materials as the gun boats, at a cost of 50,500 to 62,000 dollars each, the engines costing 25,000 dollars each. At the same time the sailing vessels were changed into screw steamers, Engines of 360 horse power were already at that time being constructed in Russia.

On the White Sea, six steam clippers of 150 horse power were built by the Government at Archangel; they were made of wood, and brought to Cronstadt after the war. The cost of the hull of each of these boats was 31,990 dollars; and the engines, 20,000 dollars apiece. Naturally, the short space of time allowed for building these vessels prevented the work from being carried out in the best manner; still the engineers, artisans, and architects, having had much experience in ship building, did very good work considering the little time allotted them. After the treaty of Paris, the Naval Department commenced a regular and systematic reorganization of the fleet, and of ship building in Russia with home materials. The views of the late Emperor concerning the position of the fleet are expressed in the following words: «Russia must be a first class naval power; her fleet must take rank in Europe after those of England and France, and must exceed in strength the united second class naval powers». The ship-building sphere of the Ministry of Marine was therefore accordingly determined from that date.

For carrying out this plan, wharves, docks, and harbour works were instituted, the best drawings and information concerning all improvements were obtained, capable officers were sent abroad to study special branches of science, and the «Naval Magazine» was enlarged to facilitate a free exchange of opinions between competent persons. Although financial circumstances were somewhat straitened after the war, still from the treaty of Paris until 1863, the Baltic fleet comprised the following wooden screw steamships:

|  |    |
|--|----|
| Three deckers . . . . .                | 3  |
| Frigates, 2 built abroad . . . . .     | 7  |
| Corvettes, 1 built abroad . . . . .    | 6  |
| Clippers, 1 built abroad . . . . .     | 7  |
| Sea gunboats, 1 built abroad . . . . . | 3  |
| Total . . . . .                        | 26 |

During the civil war in the United States the ironclad «Merrimac» revolutionized the construction of warships, and the whole world commenced building armour-plated vessels. Every year brought forth new inventions and it became necessary to establish within the country all the means for ship building, and to develop and support all the private ship-building firms and engineering works. The first ironclad,

*Pervenets* («The Firstborn») was built in England in 1863, and brought to Cronstadt; the second, *Ne tron menya* («Touch-me-not»), was built in Russia. In order to quickly establish an ironclad fleet, two wooden 58-gun frigates were covered with 4 $\frac{1}{2}$ -inch armour plate, ordered in England. Monitors, turret ships, and batteries were then commenced, and in 1863 the building of iron and armour-plated vessels was already on a firm footing in Russia.

In January, 1870, the Baltic ironclad fleet consisted of twenty-three vessels with 162 guns with a broadside charge of 24,256 pounds. The total nominal horsepower was 7,110, and the total displacement 61,390 tons. In 1870 it became necessary to adopt a new class of vessels, called ocean cruisers. During the Turkish war of 1878, four cruisers were bought in the United States; and then a whole fleet of ironclad cruisers was built in Russia, terminating in the launch of the «*Buric*», a vessel of 11,000 tons displacement, built at a Russian ship building yard out of home materials.

In the list of vessels, edited by the Department of Trade and Manufactures in 1890, there are 210 of various kinds in the fleet on all the seas of Russia; this is a list of vessels of more than fifty tons displacement. The future condition of ship building in Russia is so well guaranteed by the excellence of the foundries and ship building yards, of materials, staff and workmen, that there are at present in course of construction for the Baltic Sea, four squadron ironclads, two ironclads for coast defense, two torpedo cruisers, one training ship, and five torpedo boats. At the same time there are in course of construction for the Black Sea, one squadron ironclad, one torpedo cruiser and one steamer. The Russian Marine Department is latterly very independent as to the type of its warships, not following the samples of the different countries of Western Europe. Thus for example, the ocean cruisers with their broadside armour plates are of original Russian type, as well as the first sea torpedo boats. In details the building of Russian war ships has many independent methods. All this speaks for itself.

It is well known that the legislative measures referring to private ship building have done much to assist its further development. The history of Russian law, guarding the liberty of cruising on all inland rivers, and that of ship building, dates from the year 1649, or from the code of the Tsar Alexis Michailovitch. These laws were then supplemented in the beginning of the XVIII century, particularly during the reigns of Peter the Great and his successors; and up to the present time the legislation jealously guards the right of cruising for Russian subjects upon all waters of the Empire, and reserves the right of coasting for the exclusive benefit for Russian subjects. These protective legislative measures laid the foundation for the development of Russian navigation, especially along the seashores. In order to encourage the progress of this important branch of trade, navigating premiums were also granted to certain enterprises which bound themselves to carry the mails, and keep up a regular time service along the shore lines, and to distant ports.

In the Forestry Statute, ship building is subject to certain privileges in the matter of obtaining timber. By civil law all owners of water and banks are forbidden to put any obstacles in the way of timber or vessels afloat. The boundary laws decree that towing paths shall be measured off from the landowners, for the free use of all who may require them. The statute of ways and means decrees that along these towing paths anyone

shall be at liberty to build, caulk, tar, or repair vessels. The statute of commerce gives detailed regulations about ship-building contracts and deals with the rights of ship building, the plans, estimates, and materials used for merchant vessels, and the examination of sea ships. There is an advantageous scale of deferred payments instituted for the customhouse duties on vessels built abroad. It must, however, be observed that of late years so many new and important legal questions have sprung up in connection with navigation and ship building, characterized by the fact that up to the present time most of the Russian exports are conveyed abroad in foreign ships, that a special commission has been formed in the Ministry of Finance for enquiring into the best means of protecting and developing Russian trade, navigation, and ship building. Besides this, of late years much attention has been given to improving the river systems, and seaports like Marioupol on the Sea of Azov, Libau on the Baltic, and others; but information on these subjects, which are vital economical questions, pertain to the sphere of action of the Ministry of Ways of Communication, which has prepared a Special Review of the land and water communications of Russia, for the World's Columbian Exhibition.





## CHAPTER XXII.

## Carriage Manufactures.

THE enormous extent of the Russian empire, with its varied conditions of climate and soil, with its well-constructed ways of communication in some places, and its primitive roads in other districts, naturally involves an equal variety in the types of equipages used in travelling over the different parts of the country. Thus, in the Caucasus, besides equipages of the ordinary type, two-wheeled tilted carts (*arbic*), having wheels two and a half arshines high, and without iron bracings, are met with. On the opposite frontier, in Finland, are seen the so-called *dvoukolkie*, vehicles on two wheels, without springs, and which in districts contiguous to large towns are replaced by similar conveyances on springs. In the western provinces are still greater varieties: the *brietchka*, a half-covered carriage, and the *neitychanka*, which has sometimes a hood and sometimes not, and is with or without springs. In central Russia there are equipages of a very original and primitive character: the *teleiga*, a kind of cart, the earliest type of country conveyances, and the one most in use to the present day; the *tarantass*, a roomy travelling coach, the most widely spread type of a Russian summer travelling equipage; and lastly, the *droshky* and *proletka*, or hooded droshky, the equipages mostly used in towns and cities. The first winter fall of snow has scarcely covered the ground, when over all Russia wheeled vehicles are replaced by sleighs. Russian sleighs are lower in their underframe than the American, and are at the same time more comfortable, since they are buttoned over with a covering to protect the legs and feet from the cold. Russian town sleighs are further distinguished from the American in the construction of the coachman's box, which is in front, and a little higher than the seat for those riding in it, whilst the fore-partition rises to the coachman's belt, the sides being also closed in with wood, or leather hangings, so that his legs and feet are well protected from the frost. They have sometimes been criticised in Western Europe as not being sufficiently comfortable, but it must be acknowledged that, in their construction, they are admirably adapted to the rigorous winters of Russia. The town sleighs are often remarkable for their fine work and elegant finish. The wooden parts

are often veneered with oak, curled beech, and other woods of a superior kind. The lap-cover is either of cloth trimmed with fur, generally bearskin, or is made entirely of fur; in the latter case, owing to the high price of the fur, the lap-cover often costs more than the sleigh itself, especially if it be of American bearskin, which is highly valued and esteemed in Russia, and a cover of this kind is considered to be a necessary accessory of the more fashionable sleighs.

Sleighs in the provinces are naturally of a simpler and cheaper construction, being made of common, and generally unpainted wood; on the seat is a cover that hangs down over its back, and they are also provided with a cover for the legs. Sleighs are always made with shafts and a shaft-bow, and are for one, two, or three horses. In sleighs drawn by two or three horses, (troikas), the thill-horse goes at a trot, whilst the off-horses gallop, with their heads bridled down and turned a little out; sleighs with two horses are used only in towns, and in the western districts form the ordinary kind of town sleighing. Travelling sleighs are generally covered, are furnished with lap-covers, and are curtained in for protection from the cold and wind.

The manufacture of sleighs and carts (*teleigi*) in Russia dates from an early period, and has long been extensively carried on in the two capitals, where special cartwright works, afterwards converted into coachworks, were founded. Peter the Great, always the leader in word and deed of every social movement, did not neglect this branch of industry. In the Court Stable Museum at St. Petersburg, which contains the largest and richest collection in the world of equipages and harness trappings, is still preserved a covered winter sleighing coach, made with his own hands. Sleighs, completely closed in like carriages, have from the earliest time been adopted in all parts of Russia for long winter journeys.

Equipages having any pretension to elegance or luxury were not known in Russia before the reign of the Empress Elisabeth. The first carriage of this kind was a present made to the Empress in 1746 by Frederic King of Prussia. This carriage is still to be seen in the above-mentioned museum. It would appear to be of London manufacture, and is hung on straps. This carriage was repaired in 1856, and was used by the Empress Marie Alexandrovna for her triumphal entry into Moscow, and also in 1883 for the state entry into Moscow of the reigning Empress Marie Feodorovna on the day of the Coronation.

About the same time, that is, towards the middle of the eighteenth century, there was made in St. Petersburg a covered winter two-seated *droshky* (*lineika*). Its front and back parts were painted in gold, its corners were adorned with gilt-carved woodwork, and the upper part with flowers moulded in brass. In this *lineika*, as is well known, the Empress Elisabeth Petrovna travelled from St. Petersburg to attend the ceremony of Coronation at Moscow, and it is kept to the present day in the arsenal of that city.

State Court equipages were after that time more than once ordered from abroad. In the Court Stable Museum, 41 such equipages of different kinds, phaetons, barouches, vis-à-vis, and sleighs, are still kept; some of them being of foreign, others of Russian make. All these equipages are finely worked, being embellished with gilding, painting, and mosaic work, and adorned with armorial bearings and allegorical figures. The larger number of these equipages are of London make, and came from the then famous carriage manufacturing firm of Buckindale. A four-seated

eight-windowed carriage, made by Gravelot, was bought in 1773, and is interesting as being the first equipage on springs introduced into Russia. Almost all the carriages just spoken of were thoroughly repaired in 1826, 1856, and 1883, and were used by their Majesties in the Coronation processions at Moscow. The earliest two-seated barouche, also to be seen in the museum, was brought over from England by Count Orlov as a present to the Empress Catherine the Second. It is on springs, open at the sides, and adorned with the finest woodwork, and the paintings executed by the well-known Bouchet. Some of the oldest and more fantastically finished sleighs, in addition to the usual ornaments in gilt woodwork and the armorial bearings, are also embellished with allegorical figures. These sleighs, which are for the most part of foreign make, London or Swedish, were much in use during the reign of Catherine the Second, for pleasure trips, or for drives to masquerades, balls et cetera. In the same reign a special Court Department was established at St. Petersburg under the name of the Work Yards, and at Moscow under the name of the Court Carriage Works, for which skilled hands were engaged. Later, the Work Yards were transformed into the Master Workmen Yards, and in which military workmen were employed.

It is not known when the first coachmakers appeared in Russia. The earliest manufacture of equipages was in the hands of saddlers, and were made piecemeal, the different parts being ordered from different workshops, as indeed at that time was the case in other European cities. These saddlers were thus accustomed to order the body of a carriage from a joiner, the iron work from a blacksmith, and the frame timber work, from a wheelwright; and having in this way obtained the raw materials, had them coloured by a painter, and they themselves only put them together. In a similar way, and from the earliest period, travelling coaches (*taran-tasses*) and other vehicles in ordinary use in the provinces of Russia were manufactured.

The first saddler in St. Petersburg who occupied himself with putting together the parts of more or less sumptuous equipages, was Ricquet, who became a member of a guild in 1775. His example was followed in 1776 by Froebelius, in 1778 by Tatsky, in 1779 by Werner, and in 1790 by Stafeev and Yakovlev. In the St. Petersburg museum are seen sleighs made by the saddlers Heyer and Tatsky, as well as by the special technicians of the Master Workmen Yards.

The earliest complete carriage factory, for carriages, barouches, and other town equipages, was established in St. Petersburg by the saddler Joachim, in 1792, to whom a large plot of ground near the Ismailov Bridge was granted by the Emperor Alexander the First, for the construction of a carriage factory. In this factory were prepared all the different parts of an equipage, from the body and iron works down to the colouring and lining of the vehicle. The equipages made in this factory served as models for the St. Petersburg saddlers and for the Moscow cartwrights, or makers of *teleigas*, who gradually began to make all kinds of town equipages on springs. Among the oldest of the Moscow firms may be reckoned those of Markov (1784), Miakoshev, and Illine.

In 1820, the Master Workmen Yards were closed, and in their place, according to a plan drawn up by the engineer Solomka, the Court Carriage Manufactory, with a military workshop, was established. At first, little more than repairs of equi-

pages were carried on in this establishment, and very few, if any, new equipages were made. All equipages for the Imperial Family were ordered from abroad, or made at the works of private carriage manufacturers, such as Joachim, Froebelius, and Tatsky. Droschkies and sleighs were made by Yakovlev. The manufacture of elegant town equipages in Russia was for a long time confined to reproductions after foreign models. For this reason, the Court and wealthy people preferred to order equipages from abroad, inasmuch as they were both better made and cheaper, and up to the commencement of the latter half of this century the import of equipages was very considerable. But about this time the manufacture of equipages in Russia began to make great progress. Owing to their admirable work, the excellence of the raw materials employed, and their comparative cheapness, those turned out by Russian firms were able to bear comparison with those of foreign construction. And when men with a special technical training began to occupy themselves with this industry, there were soon manifested praiseworthy efforts to turn out equipages that, in shape and form, should be well adapted to the local conditions of climate and roads. From this time, the manufacture became solidly established in Russia, and its rapid success was proved by its exhibits frequently receiving the highest prizes in different Russian and foreign exhibitions.

Carriage manufacture of every kind continued to develop more and more in Russia till the year 1855, in consequence of the constantly increasing demand for travelling and town equipages, and the already existing factories extended their operations, whilst new ones were being constantly founded. But with the introduction of railways this branch of industry visibly declined, and the demand for travelling vehicles, which had hitherto formed its principal item, almost entirely ceased. Further, the introduction of trams into the larger cities, and the erection of telephones, exercised a depressing influence on the equipage industry, and caused a considerable falling off in the manufacture, not only of public *droschkies*, but to a certain extent also of private equipages, and particularly of light *droschkies* and sleighs.

A great change was effected in the industry by the introduction into Russia, in the year 1877, of india-rubber tires. At first, these tires were sufficiently dear, but the comfort they secured by smoothness of traject and avoidance of all serious jolting, naturally caused a great demand for them, and consequently a proportionate cheapness in their production. The experience of many years has shown that india-rubber tires not only afford great comfort to those driving in a carriage furnished with them, but that the outlay incurred upon them is redeemed by the preservation from unnecessary wear and tear they afford to the equipage, and the security they ensure from serious joltings, from which an equipage must greatly suffer. Whilst a town equipage, well made, but with ordinary iron tires if in constant use on roads paved with cobstones, will last not more than ten to twelve years, and of course a poorly constructed equipage will last a much less time, an equipage furnished with india-rubber tires will, under the same circumstances, as has been proved, last above twenty years. This last circumstance naturally contributed to their more general use; and, at the present moment, in St. Petersburg, not only the larger number of private equipages, but also many of the public *droschkies* are provided with india-rubber tires. The extended use of these tires has borne heavily on first-class equipage factories, inasmuch as the sale of cheap

equipages of an inferior quality has, to their natural loss, increased, whilst repairing work has already decreased 20 per cent. On the other hand, the sale of india-rubber tires has considerably increased, and last year no less than 400,000 pounds of them were disposed of; but in proportion as their sale has augmented, the amount of carriage repairs has diminished, and is now scarcely one-half of what it was before, whilst in a similar way the demand for ready-made equipages has to a certain extent declined.

Ordinary india-rubber tires have one great disadvantage; namely, they scatter dirt over every object that happens to fall in their way; and this occurs not only in wet weather, but at every watering of the streets and roads. In consequence of numerous and constant complaints on this point, the propriety of forbidding the use of india-rubber tires in the city has more than once been mooted in the St. Petersburg Town Council. To avoid this inconvenience, all kinds of guards for the wheels have been proposed by different persons, but all such inventions have proved to be of no practical worth, partly by reason of their complicated clumsiness, and partly by reason of the costliness of the proposed apparatus, which moreover as experience has shown, do not attain the desired end. Mr. Jahn, an engineer, after having made numerous experiments, discovered about three years ago that by changing their shape, india-rubber tires can be prevented from throwing up and scattering dirt; and his invention, for which a patent has been taken out, has been proved to be thoroughly practical and completely successful. Towards the end of the year 1890, a committee was appointed by order of the Governor of the City, and after a public and detailed trial of the new tires, reported in favour of their expediency, and usefulness. Jahn's tires are made in the shape of the Roman letter V, and the rough edged side is turned towards the iron bandage of the wheel, like an ordinary india-rubber tire. When an equipage furnished with an ordinary smooth india-rubber tire is in motion, the tire falling between the stones with all its force, according to the weight of the vehicle and the rate at which it is going, will scatter the dirt about; but the Jahn tire, thanks to its rough edge, cannot get its socket bunged up with dirt, and even if any dirt falls into it, the dirt will be pushed aside with the rough edge of the tire and will thus remain in its place, the small quantity of splash falling under the carriage. The rough edge being, not in the middle of the tire, but on its outer side, any dirt attached to the wheel can be easily caught by splash-boards of a proper length, or, in the case of an equipage having no splash-boards, the same result can be obtained by constructing small shield-boards. Moreover, Jahn tires can be fixed to any wheel made for india-rubber tires of the ordinary smooth type, without any alteration. In spite of their novelty, they have for the foregoing reasons come to be generally used; and all the evil things prophesied of them, that they would easily burst, that they would quickly wear away, have, after two years experience, been proved to be perfectly groundless. Indeed, so far from being less durable, they are found to last longer than smooth india-rubber tires.

Of the other appliances of india-rubber in the construction of equipages, the use of india-rubber buffers in place of steel springs deserves to be noticed. This new invention is of great importance in places far removed from any town or railroad, where, in case of the spring breaking, it is extremely difficult to repair or to replace it. The swing of these buffers is sufficiently quiet and gentle; but, owing to

their fixture under the carriage being somewhat complicated, they have never come into general use. They have, however, been adopted by the War Department, and are used for military wagons, after the system of General Engelhardt.

Such then are the leading points in the past and present history of equipage industry in Russia. Proceeding now to notice the actual state of this industry, it must be confessed that in Russia it labours under far more unfavourable conditions than abroad. Of the subsidiary articles used in this business there are now manufactured in Russia with more or less success: axletrees, springs, lamps, screws, bands for india-rubber tires, and wheels. All the other necessary articles are manufactured in Russia, either not at all, or in a very unsatisfactory manner. The consequence is, each independent carriage manufactory must include every department of the industry. The best factories are obliged to order many materials from abroad, such as silk stuffs, rugs, shagreen et cetera. They must further lay in a sufficient stock of the materials, in order to allow their customers to have a good choice. A whole year's stock of dressed leather, skins, varnish, spring steel et cetera, and many years stock of the best sorts of wood, as oak, ash, hickory and mahogany, must moreover be laid in. Now, for all this a large capital is required, and in the meantime the fixed price for new equipages, when made of the best foreign materials, which are liable to heavy duties, does not even in St. Petersburg where hired labour is dear exceed, but on the contrary, is considerably lower than the Paris and London prices. And yet, the equipages turned out by the first-class Russian firms are not inferior in material, finish, or harmonious completeness, to those manufactured in London and Paris; and the same may be said of equipages manufactured in Warsaw, if they be compared with those made in Berlin and Vienna.

The types of town equipages in general use in Russia are not very varied in kind. Mail coaches, cabs, and American cars are not in use at all. Dogcarts, breaks, basket-phaetons, and similar summer equipages, are seldom to be met with. Parade or state carriages have all but gone out of use, since the Imperial Court, in accordance with the modest life it habitually leads, scarcely ever requires them. The lack of splendor and luxury in equipages proceeds in part from the fact that, till within a very recent period, there was no society for the protection and encouragement of the carriage industry. The society, established two years ago, has been limited to the granting of one annual prize for the best turn-out. There has of late been a demand on the part of different commercial firms for transport cars and wagons, and this has slightly relieved the otherwise generally prevailing stagnation in the carriage industry and trade.

The public conveyance branch of the industry, which plays such an important part in the manufacture of carriages, may be said to be in a satisfactory condition in many of the larger towns, such as Warsaw, Odessa, Riga, Tiflis, Baku, and others, as well as in the Crimea; but it must unfortunately be added, the same cannot be said of St. Petersburg, though some improvements have been made in the public *droschkies*, which in a fast approaching future are to be all provided with hood-covers.

It cannot be said that the import of foreign equipages is particularly great. During the last few years a considerable increase has been remarked in the importation of «equipages without springs, and equipages for children with springs», as may

be seen from the subjoined table of imports. But the reason of this apparent increase is to be found in the fact that in the tariff tables, velocipedes are included under this special rubric; for, as there is not a single manufactory in the whole of Russia, all velocipedes are brought from abroad. The exact amount of imported accessories used in carriage manufacture cannot be fixed with any certainty, since in the Russian tariff tables many different accessories are grouped under one particular rubric. Thus, under «railroad wares» are included axletrees, and springs. The official returns of such imports are therefore not sufficiently full, or detailed; but, as far as can be judged, their quantity cannot be very great. The amount of exports from Russia is also insignificant, as may be seen from the second of the tables immediately following.

## IMPORT OF EQUIPAGES\*.

| Y E A R.    | SPRING EQUIPAGES (LARGE). |        | SPRING EQUIPAGES (LIGHT). |        | Spring cars for the transport of pounds, also passenger cars with single back spring. |        | EQUIPAGES WITHOUT SPRING (ALL KINDS). |         | HAND SPRING EQUIPAGES FOR CHILDREN. |        |
|-------------|---------------------------|--------|---------------------------|--------|---|--------|---------------------------------------|---------|-------------------------------------|--------|
|             | Quantity.                 | Value. | Quantity.                 | Value. | Quantity.   | Value. | Quantity.                             | Value.  | Quantity.                           | Value. |
| 1882. . . . | 46                        | 29,320 | 132                       | 46,030 | 21  | 3,045  | 468                                   | 27,499  | 100                                 | 3,656  |
| 1883. . . . | 37                        | 28,150 | 138                       | 51,105 | 17  | 2,100  | 565                                   | 32,842  | 155                                 | 5,296  |
| 1884. . . . | 39                        | 26,756 | 107                       | 37,515 | 22  | 3,720  | 658                                   | 45,563  | 127                                 | 3,064  |
| 1885. . . . | 26                        | 25,050 | 60                        | 23,901 | 13  | 2,765  | 651                                   | 66,508  | 68                                  | 3,155  |
| 1886. . . . | 32                        | 24,055 | 72                        | 32,325 | 7   | 2,500  | 577                                   | 57,945  | 159                                 | 17,573 |
| 1887. . . . | 11                        | 6,850  | 34                        | 14,050 | 11  | 2,930  | 410                                   | 53,510  | 87                                  | 8,847  |
| 1888. . . . | 16                        | 12,010 | 38                        | 15,020 | 7   | 1,030  | 515                                   | 54,730  | 148                                 | 14,872 |
| 1889. . . . | 37                        | 25,830 | 48                        | 18,165 | 8   | 2,250  | 1,429**                               | 180,730 | 226                                 | 26,571 |
| 1890. . . . | 31                        | 24,350 | 64                        | 28,635 | 18  | 5,430  | 2,259**                               | 260,170 | 308                                 | 34,045 |
| 1891. . . . | 39                        | 22,468 | 87                        | 32,851 | 66  | 11,870 | 5,259                                 | 614,092 | —                                   | ***    |

The present yearly productiveness of all the Russian equipage factories cannot be given with any precision, and the official statistical returns are much below the reality, since all the village hand industries and handicrafts are free from Government control and registration. For this reason, the table given below of the home carriage manufacture, can have only a relative value, as showing the increase or decrease in the floating capital of those firms which give in annual returns, and which are reckoned among the largest and most extensive of Russian houses.

\* This table is composed according to the «Survey of foreign trade of Russia», from 1877 to 1891.

\*\* It must be remembered that under this rubric, as also for the two following years, velocipedes are included.

\*\*\* Transferred to the tariff for the year 1892, and included under one rubric with equipages without springs.

## EXPORT OF EQUIPAGES AND VEHICLES\*.

| EXPORTED THROUGH THE EUROPEAN<br>AND ASIATIC FRONTIERS, IN: | NUMBER OF<br>EQUIPAGES. | VALUE OF<br>EQUIPAGES IN<br>ROUBLES. | NUMBER OF<br>VEHICLES. | VALUE OF<br>VEHICLES IN<br>ROUBLES. |
|---|-------------------------|--------------------------------------|------------------------|-------------------------------------|
| 1882 . . . . .  | 1,004                   | 57,329                               | (no returns).          | —                                   |
| 1883 . . . . .  | 1,592                   | 72,439                               | (no returns).          | —                                   |
| 1884 . . . . .  | 480                     | 89,325                               | (no returns).          | —                                   |
| 1885 . . . . .  | 83                      | 43,560                               | 177                    | 6,447                               |
| 1886 . . . . .  | —                       | 19,320                               | 139                    | 7,780                               |
| 1887 . . . . .  | 90                      | 22,600                               | 37                     | 3,653                               |
| 1888 . . . . .  | 235                     | 29,575                               | 53                     | 3,985                               |
| 1889 . . . . .  | 85                      | 41,704                               | 117                    | 10,273                              |
| 1890 . . . . .  | 201                     | 86,960                               | 350                    | 18,745                              |
| 1891 . . . . .  | 142                     | 58,364                               | 294                    | 10,533                              |

## CARRIAGE MANUFACTURE IN RUSSIA FOR A PERIOD OF TEN YEARS\*\*.

| Y E A R S .       | NUMBER OF MAN-<br>UFACTORIES<br>AND WORKS. | VALUE OF PROD-<br>UCTS IN ROU-<br>BLES. | NUMBER OF<br>WORKMEN. |
|-------------------|--|---|-----------------------|
| 1881 . . . . .    | 148  | 2,154,000                               | 2,885                 |
| 1882 . . . . .    | 151  | 2,134,000                               | 1,980                 |
| 1883 . . . . .    | 160  | 2,381,000                               | 2,963                 |
| 1884 . . . . .    | 139  | 1,391,000                               | 2,689                 |
| 1885 . . . . .    | 129  | 1,946,000                               | 2,688                 |
| 1886 ***. . . . . | 131  | 1,850,000                               | 2,528                 |
| 1887 . . . . .    | 142  | 1,762,000                               | 2,503                 |
| 1888 . . . . .    | 137  | 2,059,000                               | 2,842                 |
| 1889 . . . . .    | 133  | 1,886,000                               | 2,747                 |
| 1890 . . . . .    | 130  | 1,914,000                               | 2,626                 |

\* Table composed according to the «Survey of foreign trade in Russia», from 1882 to 1891.

\*\* According to informations of the Department of Trade and Manufactures.

\*\*\* The returns for 1886 and 1887 include 5 factories in the Caucasus, with 28,000 roubles, and 1 in Siberia, with 1,000 roubles value of products. The return for 1888 includes 3 factories in the Caucasus with 62,000 roubles, and 2 in Siberia, with 12,000 roubles value of products. The return for 1889 includes 3 factories in the Caucasus, with 50,000 roubles, and 2 in Siberia, with 20,000 roubles value of goods.



Although there are no statistical data to judge of the extent of village hand industrial productiveness, it may be supposed, if the enormous extent of territory over which it is spread be taken into consideration, that its products, so far from being less than those of the large manufactories, will be greatly in excess of them. Indeed, without reckoning simple peasant vehicles, it may safely be estimated that the actual productiveness of the industry is twice the amount set forth in registered and official returns.

Besides the manufacture of shaft-bows, sleighs, wheels, et cetera which is spread over all Russia, there are districts where entire equipages are prepared by village hand industry. In the governments of Kazan, Viatka, and Perm, the equipage industry has flourished for a very long time, and vehicles, prepared exclusively by village *kustars* in these governments, find a ready sale throughout the eastern provinces of Russia. This village hand industry, under favourable circumstances, forms the basis of the actual professional and commercial activity of the Empire; and, in general, it secures to its customers excessively cheap, if sometimes rude and unfinished products. Thus for example, in the Novgorod government, a pair of wheels, with poplar wood fellies, is sold for 1 rouble 50 kopecks; in the Poltava government, where timber is much dearer, wheels made of the best wood that grows there, are sold in the centres of village hand industry from 3 roubles 50 kopecks to 7 roubles a set, and at 8 roubles 50 kopecks, if made to order; whilst a *bristchka* costs from 45 to 80 roubles. In the village Industrial Museum, lately opened at St. Petersburg, prevail the following fixed prices: 5 roubles for a set of wheels, made in the Medynsk district of the Kalouga government; 6 roubles for a set of *tarantass* axletrees, made in the Yaroslav government; 1 rouble 20 kopecks for four wrought-iron screw nuts; 60 kopecks for four screw nuts for light racing *droschkies*; 6 roubles 50 kopecks for a set of axletrees for *droschkies*, with horn plates and axle screw-nuts. The prices for other products are proportionately low.

The village hand industry is most widely developed in the Moscow government, which is to be explained by the easy sale of its products, and by the large orders given by manufacturers. For this reason, in Moscow, where village industrial labour can be commanded, the price of an equipage is from 10 to 20 per cent cheaper than in St. Petersburg. In general, owing to its central position, Moscow occupies the first and chief place in carriage manufacture. On the contrary, in St. Petersburg, owing to its unfavourable position, the outcome of the carriage industry is much less, though its products are far more varied in character and kind. After St. Petersburg follow in order Warsaw, Odessa, Riga, Kiev, and a few other cities. The official returns for 1888 to 1889, which are unfortunately confined to the larger factories, give 27 factories for Moscow, with an annual output to the value of 800,000 roubles; whilst for St. Petersburg they give only 6 factories, with an annual output of products to the value of 500,000 roubles. But, in fact, these figures are put considerably too low for both these two cities.



## CHAPTER XXIII.

## Review of the Russian Customs Tariff Systems.

**I**N the beginning of the present century, the customs tariff system underwent in Russia frequent fluctuations, chiefly under the influence of political considerations. In 1800, the protective and high tariff duty system, introduced towards the end of the eighteenth century, was enforced by the prohibition to import silk, cotton, flax, or hemp materials, glass, earthenware, or porcelain. In the earlier months of the year 1801, with a view of counteracting the development of English trade by sea, it was forbidden to export all Russian wares in general; but this decree was soon after rescinded upon the accession to the throne of Alexander the First. In 1804 the importation of English manufactured goods was forbidden. In 1810, Trade Statutes were issued with the object of restricting as far as possible the importation of foreign goods into Russia, and forbidding the import of nearly all ready-made articles, but at the same time facilitating the importations of goods on neutral vessels. With the restoration of peace in Europe, certain concessions were first made in the new customs tariff for 1816, and later the protective system was completely abandoned by the application to the whole Empire, and to the Kingdom of Poland, of the tariff of 1819 which permitted the import on reduced duties of goods that had formerly been altogether forbidden. This sudden adoption of a system that gave great freedom in the importation of foreign goods, acted very unfavourably on the manufacturing trade of Russia. At the same time, it became evident that foreign governments, in spite of all that had been said at the Vienna Congress, did not intend to introduce into their countries the system of free trade, which might have favoured the export commerce of Russia. On the contrary, a new tariff of a decidedly protective character was introduced into France, together with the establishment of the notorious sliding scale of import duties on corn. Prussia also raised the duties on all imported dry materials.

In view of all these circumstances, Russia acknowledged the necessity of changing her tariff policy, and returning to the protective system. In the year 1822, a new customs tariff was drawn up, in accordance with which many foreign goods were either forbidden to be imported, or subjected to very high customs duties.

From that date the tariff system has been more constant in its general tendency, and the changes made in it from time to time have been both gradual and consequent. The history of the Russian customs tariff may be divided, from the year 1822, into three periods: First, from 1822 to 1849, which period is characterized by a consistent maintenance of strictly protective principles, with the gradual substitution of a virtual prohibition of the importation of foreign goods by the imposition of very high duties; second, from 1850 to 1876, during which period a system of moderate protection was adopted, and finally confirmed by the tariff of 1868; third, from 1877 to 1893, in the course of which period the principle of protecting home productions and home industry has been consolidated by a series of measures, and eventually confirmed in all branches of industry by the tariff of 1891, which is still actually in force. It must, however, be borne in mind that these periods cannot be sharply fixed or divided from one another. The principles prevailing in each period were only very gradually replaced by the principles governing the tariff of the next succeeding period.

#### FIRST PERIOD, 1822 TO 1849.

The tariff of 1822, with which this period opens, was preeminently a protective one. Amongst other products, it altogether forbade the importation of textile fabrics (except batiste and cambric kerchiefs), cotton stuffs, except a few of the simpler kinds, different sorts of cloths, most silk stuffs, writing and typographical paper, copper wares, glass and porcelain goods, the better sorts of earthen wares, and refined sugar. The import of cast-iron and iron by sea was forbidden; and a duty of 90 kopecks per pound was levied on cast iron, and 1 rouble 20 kopecks per pound on assorted iron, if imported by land. The strictly protective tendency of this tariff in all that related to home productions was not modified by the changes introduced into it by Count Kankrin. These changes, which were made with the view of increasing the customs revenue, mainly consisted in substituting for strict prohibitions the imposition of high duties, in raising the duty on imported goods with the aim of equalizing the duties imposed with the value of the goods taxed, and with their brisker or slower sale; and lastly, in reducing the duty on exported goods. Thus, in 1824, the duty on cotton yarn, unboiled sugar, spices, liquors, tobacco, and wrought metals, was raised. In 1825, the duty on silk stuffs was increased, and for the first time a duty was imposed on yarn dyed Turkey-red. In 1826, the prohibition laid by the tariff of 1822 was taken off different articles, and, among other goods, the importation under a high duty was permitted of mixed cotton stuffs, except printed, dyed, streaked, or embroidered cottons, linen kerchiefs, except printed and dyed ones, the finer sorts of silk stuffs, hats, and walking-sticks. It is interesting to notice that, with the view of encouraging sheep breeding in Russia, sheep shears were allowed to be imported free of duty. In 1830, further changes were made, and articles previously prohibited were now permitted to enter Russia «for the sake of quickening the home trade and affording models for home manufacturers.» Towards the end of 1831, the duty on the more valuable sorts of wood used in joinery and carpentry, on indigo and other dyeing materials, on spices, oil, wine, et cetera, was raised. Independently of this, it was decreed that a supplementary

duty, in proportion to 12<sup>1</sup>/<sub>2</sub> per cent of the duty actually imposed, should be levied on all imported goods of every kind. As the increase in duties made by this decree had solely in view the augmentation of the custom revenues, rather than the encouragement of home manufactures and products, it was found possible, in 1836, when the financial position of the country had improved, to lower the proportion of the supplementary duty. According to the tariff table for 1836, the duty on all materials employed in handiwork, and also on certain ready-made goods, was diminished in the proportion from 10 to 12 per cent. At the same time, some articles were freed from the prohibition hitherto placed on them. The further changes introduced into the tariff of 1838 were made in the same direction. The export duty was suppressed on naphtha, hare skins, dressed hides and flaxen tissues, iron, smithcraft products, and wool; whilst the duty was lowered on exported hops, corn, cattle, and potash. In 1841, the partial changes introduced into the tariff by Count Kankrin, Minister of Finance, were fully carried out by the issue of a new customs tariff, which was confirmed by the Emperor, November 28, 1841, and came into force, on and after January 1, 1842. The principal changes introduced by this tariff consisted in the removal of many prohibitions, the only articles, the importation of which continued to be forbidden, being the following: albums, chemical drugs, gold embroidery, gold-woven and galloon work, linen, ready made clothes, coffee substitutes, printed stuffs, and a few other unimportant articles. In all its clauses, the supplementary duty of 1831 was included in the general assessment, and a round duty was fixed, with an increase in most cases of 30 per cent, on drugs, gloves, optical glasses, assorted lead, wire strings, et cetera. The duty on cocoa, spices, the finer sorts of fur, was lowered. Cooper wares and products, as well as agricultural machines, were allowed to be imported free of duty.

The following table is intended to show the state of foreign trade and commerce during the period above mentioned:

| YEARS.         | EXPORT.         | IMPORT.    | EXCESS OF EXPORT (+)<br>OR IMPORT (-). | CUSTOMS REVENUES. |
|----------------|-----------------|------------|--|-------------------|
|                | R o u b l e s . |            |  |                   |
| 1824 . . . . . | 50,300,000      | 42,100,000 | + 8,200,000                            | 11,100,000        |
| 1825 . . . . . | 59,800,000      | 44,100,000 | + 15,700,000                           | 12,700,000        |
| 1826 . . . . . | 44,600,000      | 73,800,000 | - 29,200,000                           | 12,300,000        |
| 1827 . . . . . | 56,600,000      | 46,100,000 | + 10,500,000                           | 13,800,000        |
| 1828 . . . . . | 50,200,000      | 47,300,000 | + 2,900,000                            | 14,900,000        |
| 1829 . . . . . | 56,500,000      | 53,100,000 | + 3,400,000                            | 16,000,000        |
| 1830 . . . . . | 63,500,000      | 43,900,000 | + 19,600,000                           | 17,200,000        |
| 1831 . . . . . | 61,400,000      | 41,900,000 | + 19,500,000                           | 18,200,000        |
| 1832 . . . . . | 61,600,000      | 43,900,000 | + 17,700,000                           | 23,300,000        |

| YEARS.         | EXPORT.         | IMPORT.    | EXCESS OF EXPORT (+)<br>OR IMPORT (-). | CUSTOMS REVENUES. |
|----------------|-----------------|------------|--|-------------------|
|                | R o u b l e s . |            |  |                   |
| 1833 . . . . . | 59,000,000      | 45,000,000 | + 14,000,000                           | 23,400,000        |
| 1834 . . . . . | 55,400,000      | 53,300,000 | + 2,100,000                            | 23,000,000        |
| 1835 . . . . . | 54,100,000      | 54,200,000 | - 0,100,000                            | 22,400,000        |
| 1836 . . . . . | 69,400,000      | 56,600,000 | + 12,800,000                           | 23,300,000        |
| 1837 . . . . . | 63,800,000      | 60,400,000 | + 3,400,000                            | 25,600,000        |
| 1838 . . . . . | 77,900,000      | 59,600,000 | + 18,300,000                           | 24,900,000        |
| 1839 . . . . . | 86,400,000      | 59,600,000 | + 26,800,000                           | 25,500,000        |
| 1840 . . . . . | 76,600,000      | 67,300,000 | + 9,300,000                            | 26,400,000        |
| 1841 . . . . . | 76,900,000      | 65,200,000 | + 11,700,000                           | 26,600,000        |
| 1842 . . . . . | 74,100,000      | 69,900,000 | + 4,200,000                            | 29,900,000        |
| 1843 . . . . . | 73,200,000      | 62,600,000 | + 10,600,000                           | 29,500,000        |
| 1844 . . . . . | 82,500,000      | 65,800,000 | + 16,700,000                           | 31,900,000        |
| 1845 . . . . . | 81,100,000      | 68,500,000 | + 12,600,000                           | 30,400,000        |
| 1846 . . . . . | 90,700,000      | 71,700,000 | + 19,000,000                           | 30,300,000        |
| 1847 . . . . . | * 136,900,000   | 74,000,000 | + 62,900,000                           | 29,100,000        |
| 1848 . . . . . | 78,500,000      | 76,800,000 | + 1,700,000                            | 29,600,000        |
| 1849 . . . . . | 85,700,000      | 81,900,000 | + 3,800,000                            | 29,900,000        |

It appears from these returns that in the twenties the average amount of exports may be valued at 53,000,000 roubles, exceeding by 2,000,000 the value of the average annual imports (51,000,000 roubles), the customs duty forming 27 per cent of the import value. In the thirties the average yearly export reached 65,000,000 roubles, exceeding the mean yearly import by 13,000,000 roubles, the customs duties forming 45 per cent of the import value. Finally, in the forties, the average yearly export, excluding the abnormal year, 1847, grew to the sum of 80,000,000 roubles, or 10,000,000 roubles more than the amount of the mean import, of which the duties collected were about 30 per cent.

\* The great increase in the exports for the year 1847 is to be explained by the extraordinary demand for Russian grain that year, in consequence of the complete failure of the crops in many of the countries of Western Europe. Thus, 5,954,000 chetverts of wheat were exported instead of 3,188,000 chetverts as in 1846, and 2,789,000 chetverts as in 1845; 2,700,000 chetverts of rye, instead of 1,709,000 chetverts as in 1846, and 244,000 chetverts as in 1845; and 5,863,000 roubles worth of rye flour, instead of 928,000 roubles worth, as in 1846, and 787,000 roubles worth, as in 1845. In all, the grain and flour exports amounted in value to 71,280,000 roubles, instead of 28,929,000 roubles, as in 1846, and 16,573,000 roubles as in 1845.

For the period reviewed there are no systematic data relating to the growth of the manufacturing industry in Russia, which in many branches is mainly developed as a household trade, not easily registered. However, as far as may be seen from the occasional data upon the subject, it may be inferred that, owing to the influence of the protective tariff together with other measures furthering the home production, the Russian manufacturing industry developed greatly. Thus, in 1825 there were 484 cotton factories, employing 47,000 hands, and in 1850 their number was 536, with 110,000 workmen. In the beginning of the twenties cotton factories were almost exclusively made of imported yarn, to the value of 8,640,000 roubles, and cotton tissues, to 2,000,000 roubles; at the end of the forties the cotton spinning industry was already firmly established in Russia; in 1847 to 1849 the mean import of raw cotton was 1,200,000 pounds, that of yarn being only to the value of 4,400,000 and of tissues to 1,150,000 roubles. Of cloth factories, 324 existed in 1825, with 64,000 workmen, and in 1850, already 633 such works were reckoned, employing 98,000 hands. The number of silk-weaving establishments amounted in 1825 to 184, with 10,000 workmen, and to 384 in 1850 with 17,000 hands employed. At the 87 paper mills, in existence in 1825, 8,000 men were engaged in the work; in 1850 the number of factories increased to 159, and that of hands to 15,000.

## SECOND PERIOD, 1850 TO 1876.

The gradual change of the prohibitory system of the customs tariff for a protective policy began soon after Count Kankrin left the post of Minister of Finance. An Imperial ukase, of April 17, 1845, abolished the prohibition of the import of printed silk wares, trinkets, bronze and marble articles, watches, albums et cetera; in the mean time a free export was established for oil seeds, tea brought through Kiachta as a transit ware, and rope. On June 1, 1846, the Emperor sanctioned the opinion of the State Council, by which the export taxes on tallow, hemp, flax, and bone in lumps, were removed, while the duties levied on imported chemical products, faïence crockery, black and green cloth, highest sorts of lace, ostrich feathers, pomatum, coffee, spices, and some other foodstuffs were lowered, and the import of wares of platina permitted. The tariff of 1850 did still more in this direction.

The working out of this tariff began already at the end of the forties, the well-known economist Tengoborsky taking a part in it; and the following questions were considered: 1. the simplification of the tariff clauses; 2. the improvement in the classification of the wares, and the placing of duties more conformable to the value of the articles subjected to it; 3. the furthering of the home production by the competition with foreign goods, as well as by the lowering of taxes levied on different half-finished wares, and on the principal raw materials used in manufacture, such as chemical products and dyes; 4. the abolishing of such prohibition as was not absolutely necessary; 5. the lowering of certain of the duties which exceeded the degree, needed for the protection of the home industry, and could thereby injure the regular trade, and be prejudicial to the State revenues by encouraging smuggling; 6. to help the consumers, and further the development of the external trade by increasing the

number of the articles for exchange; 7. to open new sources of revenues to the State Treasury, by allowing the import of such articles as were until then prohibited; and in general, to prepare the transition to the system of moderate protection.

Independent of that, one of the most important problems to solve was the composition of a general tariff for the Empire and Poland, as in 1822 the custom's line separating them was abolished. The greatest difficulty consisted in the difference of the tariffs, as according to that, until then existing in Poland, much smaller duties were levied, especially on foodstuffs and raw and half-wrought materials needed in the manufacturing industry.

The prohibitory tariff of 1822 had not been extended to Poland in which with some changes the moderate tariff of 1819 was still in force. The trade between Russia and the vice-royalty of Warsaw was carried on according to the law of August 1, 1822, and the statute of June 30, 1824, concerning the transport of the local wares from the Empire into Poland, and vice versa. These regulations were as follows: 1. All raw materials worked in both parts of the State were allowed to be transported from one to the other free of all duty; 2. an import tax of 1 per cent ad valorem was levied in both countries on the articles worked from their respective raw materials, and brought from one to the other; 3. for wares produced of foreign materials in Russian or Polish factories, a duty of 3 per cent ad valorem had to be paid; an exception was made of cotton yarn and cotton tissues, and refined sugar when brought from the Empire into Poland; a tax amounting to 15 per cent of the value for cotton goods, and one of 25 per cent for sugar, being imposed in that case.

The above mentioned bases of the counterchange of wares tending to the advantage of Poland's industry, especially to that of wool, reacted on the trade balance of both countries; thus, during the period from 1825 to 1829, the yearly import from Poland to the Empire averaged 7,827,000 roubles, including finished wares for 6,937,000 roubles (of which 6,768,000 roubles fell to cloth goods), and foodstuffs and materials for 684,000 roubles; the average yearly export from the Empire into Poland was only 6,136,000 roubles, out of which 1,927,000 fell to ready articles, and 2,501,000 roubles to raw materials and foodstuffs.

| Y E A R S.              | EXPORT FROM THE<br>EMPIRE INTO PO-<br>LAND. | IMPORT FROM PO-<br>LAND TO THE<br>EMPIRE. |
|-------------------------|---|---|
| Thousands of roubles.   |   |   |
| 1843. . . . .           | 1,981                                       | 1,162                                     |
| 1844. . . . .           | 1,994                                       | 1,042                                     |
| 1845. . . . .           | 2,295                                       | 1,094                                     |
| 1846. . . . .           | 2,340                                       | 1,316                                     |
| 1847. . . . .           | 2,835                                       | 1,608                                     |
| Average yearly. . . . . | 2,123                                       | 1,244                                     |

After the subdual of Poland a new tariff for the trade between it and the Empire was published, (November 13, 1834), which lessened to some extent the advantages of the trade of the Kingdom, by placing higher duties on the wares brought therefrom to the Empire; for instance, a tax of 15 per cent ad valorem was placed on woollen goods. At the end of the period reviewed the trade balance changes to the profit of the Empire, the export from it to Poland exceeding the import of the Polish goods into the Empire, as seen from the table on the preceding page.

The import from Poland consisted as before of finished wares, and the export from the Empire, of foodstuffs and raw materials.

| YEARS.             | EXPORT FROM THE EMPIRE.       |                 | IMPORT FROM POLAND.           |                 |
|--------------------|-------------------------------|-----------------|-------------------------------|-----------------|
|                    | In thousands of roubles.      |                 |                               |                 |
|                    | Foodstuffs and raw materials. | Finished wares. | Foodstuffs and raw materials. | Finished wares. |
| 1843 . . . . .     | 978                           | 174             | 473                           | 689             |
| 1844 . . . . .     | 862                           | 143             | 372                           | 670             |
| 1845 . . . . .     | 1,284                         | 108             | 421                           | 672             |
| 1846 . . . . .     | 1,392                         | 133             | 468                           | 848             |
| 1847 . . . . .     | 1,750                         | 116             | 701                           | 906             |
| Average yearly . . | 1,253 *                       | 135             | 487                           | 757             |

As the introduction of the high Russian tariff into Poland was likely to be followed by a shock in the local manufacturing industry, and by a surcharge of the consumers; and as, on the other hand, the spreading of the moderate Polish tariff over the Empire threatened to lessen the customs revenues, to uphold the interests of both sides differential duties had been allowed in the tariff of 1850, namely, higher duties on wares imported by sea, which generally supplied the Empire, and lower duties on goods imported by land, as forming the chief supply of the Kingdom. The new tariff, founded on the above-mentioned bases, for the Empire as well as for Poland, was introduced January 1, 1851. In it the clauses were simplified, and their number diminished from 1,176 to 442; out of 89 prohibitory clauses 76 were abolished, and duties on 725 clauses were lowered, which according to the import value of the preceding years amounted to the sum of 1,435,000 roubles.

The next general change in the tariff duties was made in 1854, called forth by the stand-still of the external trade by sea, and the concentration thereof on the western frontier during the Crimean war. In order to help the land trade, and to keep Russia from a probable trade crisis, it was reckoned necessary to lower the duties on almost all of the wares imported across the above frontier. At the end of the war a new revision of the tariff had been undertaken, with the aim of changing the exclusive measures introduced during the time when the Russian ports were

\* The remainder of the export consisted of animals.



blockaded by the enemies, as well as to promote further accordance of the customs systems with a moderately protective policy. The changes made were founded on the following considerations. Although the duties on some goods were lowered in 1850 by a quarter to one-half of the former, however in many cases it proved insufficient for the desired furthering of the external trade and the lessening of smuggling, because: 1. the former was so high that the duties often exceeded to a considerable extent the price of the wares; 2. the prices of some goods had declined to such a degree from the time of introduction of the former tariffs that the duties, which in the twenties formed from 30 to 40 per cent, in the forties amounted from 80 to 100 per cent ad valorem. Thus, according to the tariff of 1850, too high duties were placed on some of the wares, encouraging thereby smuggling to the detriment of the customs revenues and regular trade, without helping in any way the home manufactures. This fact showed the necessity of lowering some of them. Besides, the great difference established between the duties on goods brought by sea and on those by land had also to be diminished, as after the raising of the blockade it called forth an increase in the import of goods by land, to the disadvantage of the marine trade. Finally, although changes had been made in the tariff of 1850 with a view to simplification, disagreements however often arose between the merchants and the customhouses, as different duties were levied on wares, the quality of which was in the main similar.

The new tariff was ratified by the Emperor on March 25, 1857, and set in force from the day when it was received by the customhouses. In this tariff the classification of goods imported was once more simplified, and the number of paragraphs diminished from 442 to 368, not counting the special list of apothecary wares; of the 19 articles formerly prohibited, 7 were allowed to be imported, and on 299 articles the duties were lowered, on the whole by 1,900,000 roubles, as compared to the customs revenues of 1851 to 1854.

According to the principles taken already as a basis for the tariff of 1850 with the view of a gradual transition from the prohibitory system to that of a protective policy by the schedule of 1857, comparatively high duties were placed on goods in more general use, in order to protect such branches of home industry as employed the greatest number of hands, and supplied the wants of the bulk of the consumers; more moderate duties were levied on such articles as did not afford any danger of competition. In the mean time the duties on materials used at the factories and trade establishments were lowered, as well as those on some of the food-stuffs, such as wine, coffee, spices, fruit, and the like, with the view of increasing the customs revenues. Besides this, according to the tariff of 1857, the duties levied on goods imported across the land frontier were made equal to those on goods brought by sea, in order to enliven the Russian sea trade. However, the smaller rates were preserved for some articles, imported across the land frontier, partly in order to help the local inhabitants in the acquisition of such wares as would be too expensive if brought from the ports or the interior government, partly in order to limit the development of the smuggling trade, as the extensive frontier line afforded great facility therefor.

The next general revising of the tariff, on the course of the change of the patronizing system to that of a moderately protective policy, refers to 1867, although

in 1857 there were already made important alterations in the same direction. According to the opinion of the Council of State, sanctioned by the Emperor on June 19, 1859, duties were lowered on cast-iron to 5 kopecks per pound; on bar iron, to 35 kopecks per pound; on assorted iron, to 45 kopecks per pound; and on sheet iron, to 70 kopecks per pound. According to the State Council's opinion, sanctioned by the Emperor, May 8, 1861, machine-building factories were allowed to import iron and pig iron free of duty. In 1865 the taxes on many goods were lowered, and the list of articles, allowed to be imported duty free, was enlarged. On March 30, 1861, the opinion of the State's Council allowing the import of the Kiachta teas across the European frontier was sanctioned by the Emperor. This import was until then prohibited by the tariff of 1822, the measure calling forth the smuggling trade on the western frontier, which developed still more when, according to the treaty of 1843, five Chinese ports were opened to the European trade. The abolishing of this prohibition in 1861 had in view the lessening of the quantity of smuggled tea, with which aim a series of other measures was equally introduced; together with the permission of the import of teas from Canton, the duty on Kiachta teas was lowered. Regardless of the changes made in the tariff of 1857, the duties were twice raised by 5 per cent on the whole, except those levied on sugar, with a view to increase the fisc, namely in 1859 and 1861.

Finally, during the same period a very important order concerning the export trade was issued; according to the opinion of the Council of State, ratified May 18, 1864, all the customs duties levied on goods exported from the Empire and from Poland were abolished, with the exception of those on lumber, potash, mats, resin, leeches, rags, and bone; by the tariff of 1867 the export taxes on lumber, mats, tar, and all kinds of tree bark, were abolished. \*

The tariffs of 1850 and 1857 did not call forth any visible increase in the customs revenues; in order to secure such an aim, as well as to facilitate the regular trade, a new revision of the tariff was instituted in 1867, the chief principles considered being: 1. the instalment of duties more proportionate to the value of the goods, with a view of limiting the smuggling trade; 2. the simplifying of the classification used in the tariffs, and the introduction of auxiliary duties of 5 per cent, in order to simplify the customs book-keeping, these duties being not levied on articles already highly taxed; 3. the equalizing of the duties on the goods imported by sea and by land, as owing to the uniting of the Empire to Western Europe by railways, no need remained for retaining the smaller dues on those imported across the land frontier, as they served only to concentrate the import trade at the land frontier to the prejudice of the Russian ports, thus increasing the number of ships coming with ballast, and the amount of the freights, and injuring thereby the export trade; 4. the diminishing of the duties levied on raw materials, inasmuch as the condition of the State Treasury could afford it.

The new customs tariff, ratified by the Emperor, June 3, 1868, was put in force January 1, 1869. According to this schedule: *a.* the number of articles comprised in

---

\* According to the tariff of 1857 many export duties had been kept; for example, those on leather, bristles, horse tails and manes, rye, oats, maize, barley, wheat, flax, hemp, copper, isinglass, et cetera.

the lists of goods imported, exported, and prohibited, as well as in that of apothecary materials, was diminished from 719 to 260; *b.* 16 classes were permitted to be imported duty free; *c.* the taxes on 152 articles were lowered by an average sum of 1,500,000 roubles, as compared to the customs duties of 1865 to 1866; *d.* for 35 articles taxes were increased by 260,000 roubles.

The following comparative figures will show the dimensions of the customs duties for the period 1850 to 1876. They refer to the principal articles of import according to the tariffs of 1841, 1857, and 1868.

| G O O D S.  | DUTIES LEVIED ACCORDING TO THE TARIFFS OF : |  |   |
|---|---|--|---|
|   | 1841.                                       | 1857                                   | 1868.   |
|   | R o u b l e s.                              |  |   |
| <b>FOODSTUFFS:</b>                                  |   |  |   |
| Coffee, per pound. . . . .                          | 6.10  | { 2.50 by sea<br>2.35 by land.         | 1.50  |
| Tea, > > . . . . .                                  | prohibited.                                 | prohibited.                            | { 15.40 black and<br>brick tea.<br>22.00 flower and<br>green tea. |
| Raw sugar, per pound . .                            | 3.80  | { 3.0 by sea<br>2.0 by land.           | { 3.00 by sea<br>2.50 by land.                                    |
| Refined > > > . .                                   | prohibited.                                 | { 5.0 by sea<br>4.0 by land.           | { 4.50 by sea.<br>4.00 by land.                                   |
| Cured herrings, per pound.                          | 0.10, 0.15, 0.4,<br>according to the sort.  | 0.10 and 0.20.                         | 0.10  |
| <b>RAW AND HALF-MANUFACTURED GOODS :</b>            |   |  |   |
| Tobacco in leaves, per pound                        | 6.00 to 12.00                               | 6.00                                   | 4.40  |
| Tanned leather > >                                  | 40.00                                       | { 10.00 by sea<br>4.00 by land.        | 8.00 to 4.40 de-<br>pendent on quality.                           |
| Flax yarn, per pound . .                            | 4.80  | 3.00                                   | 4.00  |
| Wool unspun, per pound .                            | 1.90  | 0.20                                   | 0.22  |
| Woollen yarn > > . .                                | { 4.00, not dyed<br>8.00 dyed               | { 4.00                                 | { 4.40  |
| Cotton, per pound . . . .                           | 0.25  | 0.25                                   | duty free.  |
| Cotton yarn not dyed, per<br>pound . . . . .        | 6.50  | 3.50                                   | 3.25  |
| Cotton yarn dyed, per pound                         | 8.00  | {                                      | {   |
| Cotton yarn dyed Adriano-<br>pol red per pound. . . | 15.20                                       | 5.00                                   | 4.25  |
| Pig iron, per pound . . .                           | { prohibited by sea<br>1.03 by land.        | { 0.15                                 | { 0.05  |
| Bar and assorted iron,<br>per pound . . . . .       | { prohibited by sea<br>1.38 by land.        | { 0.30 to 0.70 by sea<br>0.30 by land. | { 0.35  |

| W A R E S.                                      | DUTIES LEVIED ACCORDING TO THE TARIFFS OF: |   |  |
|---|--|---|--|
|   | 1841.                                      | 1857.   | 1868.  |
|   | R o u b l e s.                             |   |  |
| Sheet iron, per pound. . .                      | 3.60                                       | { 0.90 by sea<br>0.60 by land.                            | { 0.50                                       |
| Zinc > > . . .                                  | 1.20                                       | 0.50  | 0.30   |
| Turpentine > > . . .                            | 8.00                                       | 0.30  | 0.30   |
| Indigo > > . . .                                | 13.50                                      | { 3.50 by sea<br>2.50 by land.                            | { 3.00                                       |
| Ultramarine, per pound. .                       | 300.00                                     | 2.00  | 2.00   |
| White lead > > . . .                            | 1.50                                       | 0.40  | 0.50   |
| Verdigris, per pound . . .                      | 6.00                                       | 2.00  | —  |
| Dye extracts, per pound .                       | 5.80                                       | { 1.60 by sea<br>1.20 by land.                            | { 2.50<br>1.50                               |
| Ammonia combinations,<br>per pound . . . . .    | 1.20 to 2.85                               | 0.20 to 1.00  | 0.20   |
| Sodium, per pound. . . .                        | { 0.30 unrefined<br>1.50 refined.          | 0.10 all kinds.   | { 0.10; 0.20; 0.30<br>dependent on quality   |
| Potash > > . . . . .                            | 0.30                                       | 0.05  | duty free.                                   |
| Vitriol > > . . . . .                           | 1.90                                       | 0.70  | 0.20   |
| Glue > > . . . . .                              | 1.20                                       | 0.00  | 0.10   |
| <b>FINISHED WARES :</b>                         |  |   |  |
| Pottery, per pound. . . .                       | 4.65                                       | { 0.40 by sea<br>0.20 by land.                            | { 0.29} dependent<br>{ 1.00} on quality.     |
| Faience > > . . . . .                           | 4.65 to 12.00                              | { 1.60 to 4.00 by sea<br>0.60 to 3.00 by land.            | { 0.75; 1.00; 2.50<br>dependent on quality   |
| Porcelain, per pound. . .                       | prohibited.                                | { 6.00; 12.00; 24.00 by sea<br>5.00; 11.00; 23.00 by land | { 4.00; 8.00; 16.00;<br>dependent on quality |
| Window glass, simple<br>glass wares, per pound. | 18.00                                      | { 2.00 by sea<br>1.00 by land.                            | { 1.10                                       |
| Simple brass wares, per<br>pound . . . . .      | 6.90                                       | —   | 3.00   |
| Cast-iron wares, per pound.                     | { prohibited by sea<br>1.38 by land.       | { 0.80 by sea<br>0.50 by land.                            | { 0.50                                       |
| Iron wares > > . . .                            | 3.60                                       | 1.00  | 1.00   |
| Lead wares > > . . .                            | 12.00                                      | 1.20  | 0.80   |
| Implements and tools, per<br>pound . . . . .    | 1.50                                       | { 0.80 by sea<br>0.50 by land.                            | { 0.80 by sea<br>0.50 by land.               |
| Machinery, per pound . .                        | duty free.                                 | duty free.  | { partly duty free<br>party 0.30             |
| Cutlery, per pound . . .                        | 1.20                                       | 0.40  | 0.40   |
| Cables and rope per pound.                      | 1.60                                       | 0.40  | 0.40   |
| Fishing nets > > . . .                          | 12.00                                      | 2.00  | 0.40   |

| W A R E S.                                  | DUTIES LEVIED ACCORDING TO THE TARIFFS OF: |   |   |
|---|--|---|---|
|   | 1841.                                      | 1857.   | 1868.   |
|   | R o u b l e s.                             |   |   |
| Linen cloth per pound. .                    | 1.85 and 5.60 dependent on quality.        | { 25 per cent of the value, by sea.<br>20 per cent of the value, by land. | } 30 per cent.  |
| Twilled stuffs, per pound.                  | 2.30                                       | { 0.70 by sea<br>0.65 by land.  | } 0.65  |
| Twilled woollen goods, per pound. . . . .   | 1.20 to 3.50 according to quality.         | 0.70 to 1.40 according to quality.  | 0.40, 0.50 and 1.20 according to quality.                             |
| Untwilled woollen goods, per pound. . . . . | 1.20 to 3.50 according to quality.         | 0.60 by sea<br>0.50 by land.  | 0.50, 0.85 and 1.10 according to quality.                             |
| Printed woollen goods, per pound. . . . .   | prohibited.                                | by sea 0.80 to 1.60<br>by land 0.79 to 1.60                               | 0.65, 1.10 <sup>1</sup> / <sub>2</sub> and 1.43 according to quality. |
| Lace, per pound . . . .                     | 12.00 and 22.50                            | 4.00  | 3.00  |
| Linen clothing . . . . .                    | prohibited.                                | 35 per cent.  | 35 per cent of the value.   |
| Simple soap, per pound. .                   | 5.00                                       | 1 50  | 1.00  |
| COTTON FABRICS:                             |  |   |   |
| Not transparent, per pound                  | 0.83 to 3.50 dependent on quality.         | { solid 0.30 by sea<br>0.35 by land.                                      | } 0.28 to 1.10 according to quality.                                  |
| Transparent, per pound .                    | 2.75 to 7.20                               | light 1.00  |   |

The average turnover of the foreign trade and the customs duties thereof, during the period when the tariffs of 1850, 1857 and 1868 were in force, are seen from the following table.

| Y E A R S.                             | EXPORT. | IMPORT. | EXCESS OF EXPORT (+) AND OF IMPORT (-). | CUSTOMS DUTIES. |
|--|---------|---------|---|-----------------|
| I n m i l l i o n s o f r o u b l e s. |         |         |   |                 |
| 1850 . . . . .                         | 85.4    | 77.4    | + 8 (10 per cent)                       | 30              |
| 1851 to 1856 * . . . .                 | 98.2    | 79.2    | + 19 (24 " " )                          | 51              |
| 6                                      |         |         |   |                 |
| 1857 to 1868 . . . . .                 | 168     | 155     | + 13 ( 8 " " )                          | 33              |
| 12                                     |         |         |   |                 |
| 1869 to 1876 . . . . .                 | 314     | 399     | - 55                                    | 51              |
| 8                                      |         |         |   |                 |

\* If the war years be excluded the average yearly export = 132 million roubles; the average import = 91 million roubles; that is, the export exceeded the import by 41 million roubles, or 75 per cent; the average customs duties = 37 million roubles.

These data show that the leaving off of the patronizing system was followed by a gradual alteration in the balance of the foreign trade, not to the advantage of Russia; when the tariff of 1850 was in force the export exceeded the import, on the average, by 19 million roubles, or 24 per cent yearly, and if the abnormal years of the Crimean war be excluded, by 41 million roubles, or 45 per cent yearly; under the influence of the tariff of 1857 the excess of the export falls to 8 per cent, averaging about 13 million roubles yearly; and if the period of the cotton crisis and the years immediately succeeding to the abolishment of the obligatory labour be excluded, to 7 per cent; since the tariff of 1868 has been set in force, the import begins to exceed the export on an average by 55 million roubles yearly, or by 16 per cent.

The growth of the development of the principal branches of the Russian manufacturing industry during the tariffs of 1850, 1857, and 1868, can be seen from the following table, in which the average yearly fluctuations in the growth of these branches are given in per cents.

| MANUFACTURES.   | TOTAL VALUE OF THE YEARLY PRODUCTION. |       |       |       | AVERAGE YEARLY INCREASE (+), OR DECREASE (-) OF THE PRODUCTION. |         |       |
|---|---------------------------------------|-------|-------|-------|---|---------|-------|
|   | 1850.                                 | 1857. | 1867. | 1876. | During the tariffs of:  |         |       |
|   | Millions of roubles.                  |       |       |       | 1850.   | 1857.   | 1868. |
|   |                                       |       |       |       | Per cents.  |         |       |
| 1. Cotton spinning . . . . .  | 15.9                                  | 18.5  | 40.4  | 66.4  | +2.6  | + 7.4 * | +5.7  |
| 2. Cotton weaving. . . . .  | 12.8                                  | 15.6  | 30.1  | 36.3  | +3.4  | + 6.2 * | -2.1  |
| 3. Wool spinning . . . . .  | —                                     | 0.4   | 2.6   | 2.5   | —   | +18.5   | -0.4  |
| 4. Cloth . . . . .  | 18.2                                  | 26.0  | 34.0  | 40.2  | +6.1  | + 2.5 * | +1.9  |
| 5. Other woollen and half-woollen tissues . . . . .                     | 6.9                                   | 6.7   | 12.6  | 16.1  | -0.5  | + 7.1 * | +2.8  |
| 6. Printing, dyeing, and finishing of the fabrics . . . . .             | 16.3                                  | 16.5  | 32.1  | 37.7  | +0.2  | + 6.2   | +1.8  |
| 7. Silk weaving . . . . .   | 6.4                                   | 5.3   | 4.3   | 8.2   | -3.2  | + 1.9   | -7.4  |
| 8. Hemp spinning, and rope . . . . .                                    | 2.2                                   | 3.3   | 4.2   | 4.0   | +7.0  | + 2.4   | -0.5  |
| 9. Paper. . . . .   | 3.2                                   | 3.6   | 4.9   | 9.1   | +2.0  | + 2.8   | +7.1  |
| 10. Leather . . . . .   | 8.6                                   | 10.0  | 16.1  | 26.6  | +2.6  | + 4.4   | +5.7  |
| 11. Chemical products and dyes . . . . .                                | 2.2                                   | 3.9   | 5.0   | 5.5   | +10.0   | + 2.2   | +1.1  |
| 12. Soap, and tallow candles . . . . .                                  | 4.0                                   | 5.6   | 6.8   | 9.1   | +5.8  | + 1.8   | +3.3  |
| 13. Glass . . . . .   | 3.0                                   | 3.4   | 3.5   | 5.2   | +2.1  | + 0.3   | +4.5  |
| 14. Building of machines and railway cars; mechanical industry. . . . . | 0.4                                   | 3.9   | 14.0  | 43.4  | +5.8  | + 1.8   | +3.3  |

\* With regard to the cotton and wool manufacture, in which the obligatory labour had a vast application, the period during which the tariff of 1857 was in force can be divi-

This table shows that during the period when the tariff of 1868 was in force, the growth of almost all the important branches of the Russian manufacturing industry was a great deal slower than during the period of the tariff of 1857, notwithstanding the fact that the emancipation of the serfs, followed by a short period of retarding in the manufacturing industry, served as an active factor in the development of all its branches. Thus, the increase of cotton spinning fell from 17 per cent, which it reached in the last years of the activity of the tariff of 1857, to 6 per cent in the period from 1868; that of cotton weaving, from 24 per cent to 2 per cent; that of chemical products and dyes, from 2.4 per cent to 1.1 per cent; that of wool weaving, from 19 to 3 per cent; of printing and finishing of the fabrics, from 11 to 2 per cent. The production of such branches of the industry only increased as were put under favourable conditions by the schedule of 1868, facilitating the import of raw and half-manufactured goods used by them; for example, the leather industry, machine building, and mechanical works.

### THIRD PERIOD, 1877 TO 1891.

The above-mentioned facts, namely, the change in the trade balance to the discredit of Russia, and the unequal and even somewhat slackened development of the manufactures, together with some financial considerations of prime importance, induced the Government to return in the second half of the seventies to the system of protection.

The first measure taken was an order, issued January 1, 1877, to levy the duties in gold without diminishing face figures, on account of the low exchange of the paper rouble. This measure enlarged the customs protection of the home manufactures by 25 per cent, as compared to the average exchange of the paper rouble during the time when the tariff of 1868 was in force, and by 30 per cent after the introduction of duties levied in gold; in after years it had a still greater protective

ded into three strongly different parts, namely: 1. from 1857 to 1860; 2. from 1860 to 1863, which coincided with the emancipation of the serfs and with the cotton crisis; 3. from 1863 to 1867; during the second period of time a considerable decrease of the industry may be noticed, while in the last it is again fast rising, as shown in the following table.

| M A N U F A C T U R E S .        | 1858 to 1860.     | 1861 to 1863. | 1864 to 1867. |
|----------------------------------|-------------------|---------------|---------------|
|                                  | Increase.         | Decrease.     | Increase.     |
|                                  | P e r c e n t s . |               |               |
| Cotton spinning . . . . .        | 11.6              | 9.8           | 16.5          |
| Cotton weaving . . . . .         | 5.5               | 15.8          | 24.3          |
| Woollen fabrics . . . . .        | 6.8               | 10.3          | 18.5          |
| Printing and finishing . . . . . | 9.4               | 3.3           | 10.7          |

importance, as the paper rouble still further depreciated \*. This measure did not alter the economic order of the customs tariff, as raw materials with a few exceptions were as before subjected to the lowest duties, while higher taxes were placed on half-wrought materials, and still higher on finished goods, always ad valorem.

The levying of duties in gold had besides the protective, also a financial importance. The rapid economic development of Russia's agricultural, manufacturing, and trade industries from 1865 to 1875 and the building of a vast network of railways, comprising a line of 20,000 versts, engendered the want of drawing a large amount of foreign capital to the Empire. This was effected in different ways. Railways were constructed by means of issuing, and sending abroad railway bonds, mostly guaranteed by the Government; landowners, in order to get the money necessary for farming, mortgaged their estates to banks, which placed these mortgages abroad; many trade and manufacturing undertakings were founded upon the advances received from foreign capitalists, or upon the credit the latter opened at some of the Russian bankers and commercial bond banks. In consequence, the Russian foreign debts increased considerably, exacting yearly large sums for interest and partial payments. Thus, the payments for Government loans, for bonds of the Nicholas Railway, and for the consolidated and guaranteed bonds, amounted in 1866 to 25 million roubles, and in 1875 they grew to 66 million roubles. On considering this state of affairs, and the fluctuations to which the exchange of the paper rouble was subjected, it may be seen that the levying of the customs duties in gold afforded a certain source to Russia for the payment of foreign obligations.

After 1877 the Government raised repeatedly the customs duties in general, or only on some special articles with the view of enlarging the income of the State Treasury, and of establishing more advantageous relations between the import and export trade, considering that the latter could not always be equal, as Russia is mainly an agricultural country; therefore, it would be highly desirable to limit the import as it increased the Russian foreign debt, the exchange of the rouble being subject to many fluctuations. At the end of 1881 all the import duties were raised 10 per cent, except those on salt, this measure being called forth by the necessity of making up for the losses in the State revenues occasioned by the abolishing of the excise upon salt. In 1882 duties were levied upon some articles that were duty free under the tariff of 1868; and those on some goods, chiefly consumed by the richer classes, were raised.

The revising of the tariff in 1882 had also in view the encouragement of certain industries not sufficiently protected from foreign competition. According to this tariff the duties were somewhat raised as follows: a. on linen cloth, ready-made clothes, and linen, ad valorem duties were changed to specific; b. woollen yarn, in order to protect the Russian sheep farming from a vast import of the cheaper foreign wools; c. candles and soap, as the prices for foreign tallow had considerably lowered; d. fossil wax and ceresin, as surrogates of beeswax, capable of prejudicing the Russian agriculture; e. some of the chemical products and dyes allowed by the tariff of 1868

---

\* The average annual value of the gold rouble in paper kopecks was as follows: in 1877, 150; in 1878, 157; in 1879, 159; 1880, 154; in 1881, 153; in 1882, 161; 1883, 163; 1884, 158, in 1885, 161; in 1886, 165; in 1887, 181; in 1888, 172; in 1889, 150.



under very small duties, as materials used in manufacturing. With the same protective views a duty was placed by the tariff of 1882 on completed vessels, which until then were imported free. In 1884, on some of the foreign wares duties were raised with the aim of increasing the fisc, namely: a. on cured herrings; b. on black and brick tea, imported across the European as well as across the Asiatic frontier; c. on wine, sparkling as well as non-sparkling; d. on silk yarn; e. on vegetable oils.

In 1885, in order to uphold a profitable trade balance which threatened to change unfavourably for Russia, as some of the countries of the Western Europe had then introduced protective duties on imported household goods, especially on grain, a general raising of the customs duties on imported goods, reaching 20 per cent, with the exception of a few articles was made. On one hand, the duties on some of the foodstuffs and wares which were thought to be sufficiently high, as well as on raw and half-wrought materials, necessary to the Russian manufacture, were either left without change or raised only 10 per cent; on the other hand, the taxes on some of the goods, especially on finished wares, which were not affording the needful protection, were raised by more than 20 per cent. On some goods which had until then been imported free, protective or moderate treasury dues were placed. Finally, in 1887, as the customs revenues tended to decrease, owing to the protective measures taken with regard to pig iron, iron, and iron wares, as will be seen later, higher duties were levied on vegetables, fruit, herrings, spices, Kiakhka teas; on raw cotton, plants, joiner and turner work; on farming implements; on cotton yarn and thread, tulle, lace, coarse cloth of flax, hemp, jute, and the like; on buttons, glass beads, small trinkets, toys, watches, and patent medicines.

Owing to the above mentioned measures, the customs revenues, notwithstanding the decrease in the import due to the reinforcement of the protective policy, were in no way lessened, but grew by as many per cent during the time when duties were levied in gold, as when the moderately protective tariff of 1868 was in force. Thus the average amount of the duties for the first three years, from 1869 to 1871, was 42,300,000 paper roubles; and for the last three years under the tariff of 1868, from 1872 to 1875 \*, it grew to 57,200,000 paper roubles, or 36 per cent. The average yearly amount of the customs duties for the first three years following the instalment of duties in gold, from 1878 to 1880, was 60,600,000 roubles in gold; and in the succeeding years, from 1888 to 1890, it grew to 80,500,000 roubles in gold, or 33 per cent; this sum, if reckoned by the exchange which existed at the period, equalled 124,000,000 paper roubles, in opposition to the 57,000,000 paper roubles at which the amount of duties during the last year under the tariff of 1868 was fixed.

However, the greatest attention was paid to the protection of such branches of industry as needed help, as well as stimulation. It was regarded as a rule to change the duties gradually on some special articles, or on a separate group, according to a thorough investigation of the needs of the industry, and to the interest of the consumers; a general revision of the tariff was postponed until the time when the principal questions referring to the protection of the home production, and to the taxing of the home consumption, would be clear enough; such a general revising

---

\* The year 1876 has not been taken into consideration, as an excess in the import of wares was noticed owing to the expectation of the instalment of duties in gold.

was made in 1890 to 1891, the result being the new tariff now in force, and which will be reviewed in detail in Section IV, tariff of 1891.

The first place among the customs measures of the decade 1880 to 1890 must be allotted to those encouraging a larger development of the Russian metallic industry, using home-produced raw materials, such as pig iron and iron, and local coal as fuel. In order to have a correct idea of the importance of the last years protective tariff to the metallic industry and manufacture of wares from metals, it should be compared to the customs measures of the former times.

In the fifties, the duty upon pig iron was highly protective, as its dimensions were 1.03 roubles; and later on 0.50 roubles, and the import by sea being totally prohibited. At the end of the Crimean war a total change ensued. The Government resolved to use energetic and undeferred measures to raise the economical condition of the country; it was then that the building of railway lines in Russia, conformably to the wants of the manufacture and trade, as well as to those of the Administration, was reckoned as one of the best means leading to the above mentioned aim.

In order to help and further business, the Government resolved to facilitate essentially the bringing of metals from abroad. According to the tariff of 1857, pig iron and iron were for the first time allowed to be imported by sea, the duty on pig iron being 15 kopecks per pound, and that on iron, according to the sort, from 50 to 90 kopecks per pound, with a lowering to 30 kopecks if imported by land. Such facilitation of the import of pig iron and iron was chiefly due to the following considerations: 1. the insignificant working of metals in Russia (15 million pounds of pig iron, and ten and a half million of iron) could not be soon increased because wood coal was almost exclusively used in the manufacture, and the exhaustion of the forests could easily influence its decrease, as well as because the condition of many of the mining works was far from being satisfactory, while owing to the development of the manufacturing industry, and especially to the building of railways, the demands for iron grew constantly; 2. the iron-works being chiefly centred in the Urals, namely, four-fifth of them, and the one-fifth in the vicinity of Moscow, the transport of the metal to the different parts of the Empire was considerably surcharged. The duties were placed of such dimensions as to render the foreign cast-iron, and iron, even of the lowest sorts, a little dearer than the Russian for the central parts of the Empire, as Moscow and Nizhni-Novgorod. In order to encourage the establishment of the working of pig iron, and iron of the local ores in the south of Russia, the import of these metals straight from abroad through the ports of the Azov Sea was prohibited.

Other changes were soon made in the tariff of 1857, with the view of facilitating the import of metals. In 1859 the duty on pig iron was lowered to 5 kopecks, and steel altered accordingly; in 1861 these metals were allowed to be imported free of duty by the machine-building factories, as the tariff permitted a free import of all kinds of machines and implements; and in this state of affairs the duties on pig iron, and iron formed, so to say, a premium to the advantage of the foreign makers, and to the prejudice of the Russian machine-building industry. At first only such machine works were allowed to import pig iron and iron in quantities needed by them for the construction of machines and implements, as had steam or hydraulic motors. But later on, this franchise was extended to the works engaged in the building of ships, Men of War, hydraulic apparatus, iron bridges, as well as artillery supplies, guns,

and gun carriages; and in after years, the metals used in the working of railway appliances for the rolling stock and railroads, as well as in the building and the of the establishments themselves, were permitted likewise to be imported free of duty.

By the customhouse tariff of 1868, the regulations about the duty-free import of cast-iron and wrought iron for machine and engineering works were kept in force, although a duty of 75 kopecks per poud was levied upon locomotives, and 30 kopecks per poud upon all kinds of machinery, appliances, and instruments except agricultural, paper making, and those used in the manufacture of fibrous substances. The prohibition against importing cast and wrought iron into the Azov ports was also cancelled by this tariff. The duty on wrought iron was fixed at 35 kopecks per poud for bar iron, assorted, merchant iron and scrap; 20 kopecks per poud for rails; 50 kopecks per poud for sheet iron, boiler, and armour plate; and 80 kopecks per poud for steel. During ten years from 1868 to 1878, the mean yearly import amounted to about 2,500,000 pounds of cast iron, including 2,250,000, or about 90 per cent, free of duty, and about 5,700,000 pounds of wrought iron, including 3,600,000, or over 60 per cent, free of duty. In the space of the following three years the import of these metals considerably increased owing to the brisker condition of trade after the eastern war and under the influence of the duty in gold, and also on account of the demand for foreign cast-iron for making steel rails, at the converting works. The average yearly import for the period 1878 to 1880 was 10,900,000 pounds of cast-iron, including 5,600,000, or over 50 per cent, free of duty; and 8,000,000 pounds of wrought iron, including 3,300,000 pounds, or more than 40 per cent, free of duty.

It soon became apparent that the application in practice of the rules granting the free import of cast and wrought iron for engineering works, did not have the result which the law had in view in granting the privilege, as most of it was used in the manufacture, not of machinery and agricultural instruments, but of rolling stock and railway appliances as well as of goods for the artillery department. Therefore, and considering that the Government had taken other measures toward developing the production of railway appliances, such as raising the duty upon locomotives and tenders, fixing a premium on steel rails, and locomotives made at Russian works, including a clause in the concessions of Railway Companies with reference to acquiring railroad materials and rolling stock in Russia, in 1880 the supremely-confirmed decree of the Council of the Empire, dated July 3, pronounced that it was expedient, from January 1, 1891, to abolish the privilege of importing cast and wrought iron for engineering works free of duty; and in addition to this the duty was simultaneously raised to 80 kopecks in gold per poud upon all machinery and tools made of wrought and cast-iron, and steel; this, with the addition of 10 per cent in 1881, brought the duty up to 88 kopecks in gold per poud. In 1882 it was raised to the round number of 90 kopecks in gold per poud. In the same year the duty on cast-iron was raised to 6 kopecks in gold per poud, and the fundamental duty on wrought iron to 40 kopecks in gold per poud; on the other hand, the duty on steel was lowered in the same proportion, with the view of equalizing the customhouse duties on wrought iron and steel, in the form of materials, the cost of their manufacture, excepting that of tool-steel, being almost the same.

Under the influence of the measures taken by the Government, machine construction and the manufacture of rails gained a footing, and many works sprang up which used foreign cast-iron. At the same time iron smelting in the country progressed but

slowly, and the manufacture of wrought iron, and goods therefrom, kept pace with it. This circumstance was deserving of particular attention according as the conditions were removed which prevented the establishment of foundries using Russian cast-iron. The network of railways constructed brought the source of the cast-iron nearer the large centres of trade and manufacture. The opening of the Ekaterininsk Railway in the South of Russia, which augured much for the iron smelting and manufacturing trades on account of the abundance of ores found there, lying almost side by side with inexhaustible veins of mineral fuel, was a means of enabling these branches of industry to become firmly established.

For this purpose the Government resolved in 1884 to raise the customhouse duty on cast-iron, and to protect coal mining with a duty which, up to that time, had only been levied in the Polish customs and on a very small scale; first  $\frac{1}{2}$  a kopeck, and then 1 kopeck in gold per poud. The supremely-confirmed decree of the Council of the Empire, dated June 16, 1884, fixed the duty on cast-iron, either imported by sea or overland, at 9 kopecks in gold per poud, from July 1, 1884 to April 1, 1885; at 12 kopecks in gold per poud from March 1, 1885 till March 1, 1886; and at 15 kopecks in gold per poud from March 1, 1886. This duty was not to be subjected to any decrease during the space of twelve years from the date of its publication. In addition to this, the duty on iron ores was raised from 2 to 4 kopecks in gold per poud, in order to anticipate the possibility of any works springing up on the frontier regions, for smelting iron from foreign ores. As the duty on cast-iron was raised principally for the purpose of compelling the railway works to adopt the conversion of Russian raw material, the fundamental duty on wrought iron and steel, bar and merchant, was left unchanged at 40 kopecks in gold per poud; for the non-conformity prevalent up to that time, between the duty of 6 kopecks in gold on cast-iron and that of the  $66\frac{1}{2}$  kopecks in gold average on wrought iron, presented a considerable premium for the manufacture of wrought iron out of foreign cast-iron, and occasioned a loss to the State, which only received about 12 kopecks instead of  $66\frac{1}{2}$ , calculating the maximum of 2 pouds of cast-iron to one of wrought iron; native labour also suffered a severe loss, as iron-smelting consumes a great amount of energy. The duty was only raised from 55 to 60 kopecks in gold per poud on some special kinds of wrought iron and steel in sheets and plates, and small, merchant iron. Those duties were also raised which were in connection with the protection of raw cast-iron; namely, customhouse duties upon machinery, and in general, upon cast-iron, wrought iron, and steel goods.

With reference to machines and instruments, attention was turned to the fact that, with the design of protecting agriculture, agricultural instruments had always been imported free of duty. At the same time the abolition of the free import of cast and wrought iron for engineering works and machine constructors had placed the Russian agricultural implement makers in a worse position than when they were competing with foreign goods. In 1885, therefore, it was deemed judicious to afford some protection to the manufacture of agricultural machinery and implements, which was however subject to a lower duty than any other kind of machinery; namely, at first 50 kopecks in gold per poud, when all other machinery was charged 1 rouble 20 kopecks in gold per poud, and in 1887, when the duty on cast and wrought iron was further raised, 70 kopecks in gold per poud, when the duty on other kinds of machinery was

1 rouble 40 kopecks in gold per pound. This moderate duty on agricultural machinery was also in accordance with those measures taken with the view of protecting the native metallurgical industry, as about 1 million pounds of cast-iron and wrought iron in the shape of agricultural machinery was imported into the country free of duty.

Whilst the duties upon these materials were being discussed in 1884 it became clear that, in order to completely guarantee the iron smelting industry in the Urals, in the South, and in Poland, it would be necessary to fix the duty on cast-iron at 25 kopecks in gold per pound. The Government, however, deemed it necessary to rouse the native iron-smelting trade by degrees and with caution, in order to gradually transform the so-called converting works gradually, and without occasioning any shocks to the trade; to enable them to manufacture wrought iron and steel out of Russian, instead of foreign materials, the increased production of the native article could only proceed slowly, as the number of blast furnaces increased, and this required time. The duty on cast-iron, therefore, only attained its full protective scale of 25 kopecks in gold per pound in 1887. In addition to this, as the converting, machine-making and iron works in Poland were, on account of their position near the frontier, more advantageously situated for obtaining foreign raw material, the duty on cast-iron at the overland customhouses was raised 5 kopecks in gold, to place the Polish works on equal terms with those of the Baltic coast. Simultaneously with the further increase of protection to the iron-smelting trade, the duties on wrought iron, steel, and also on cast-iron, wrought iron, and steel goods, machines, and ships, were correspondingly raised, in order to establish harmony between the duties on raw material and manufactured goods.

The influence of the measures taken towards rousing and developing the iron-manufacturing industry is clearly shown in the following table.

| D A T E S.     | Cast-iron<br>smelting. | Cast-iron<br>imported. | Manufacture<br>of wrought<br>iron and<br>steel. | Import of<br>wrought iron<br>and steel. | Import of<br>wrought iron<br>and steel<br>goods. | Import of<br>machinery<br>and imple-<br>ments. | I n m i l l i o n s o f p o u n d s . |  |  |  |  |  |  |
|----------------|------------------------|------------------------|---|---|--|--|---------------------------------------|--|--|--|--|--|--|
|                |                        |                        |   |   |  |  |                                       |  |  |  |  |  |  |
| 1881 . . . . . | 28.7                   | 14.3                   | 35.7  | 8.0                                     | 1.8  | 2.7  |                                       |  |  |  |  |  |  |
| 1882 . . . . . | 28.2                   | 13.4                   | 33.3  | 7.3                                     | 1.5  | 3.3  |                                       |  |  |  |  |  |  |
| 1883 . . . . . | 29.4                   | 14.5                   | 33.3  | 6.8                                     | 1.3  | 3.3  |                                       |  |  |  |  |  |  |
| 1884 . . . . . | 31.1                   | 17.3                   | 34.7  | 5.4                                     | 1.1  | 0.3  |                                       |  |  |  |  |  |  |
| 1885 . . . . . | 32.2                   | 13.5                   | 33.9  | 4.3                                     | 0.8  | 2.2  |                                       |  |  |  |  |  |  |
| 1886 . . . . . | 32.5                   | 14.5                   | 36.9  | 4.5                                     | 0.1  | 2.2  |                                       |  |  |  |  |  |  |
| 1887 . . . . . | 37.4                   | 8.8                    | 36.3  | 3.4                                     | 0.7  | 0.2  |                                       |  |  |  |  |  |  |
| 1888 . . . . . | 40.7                   | 4.5                    | 35.8  | 8.9                                     | 0.9  | 2.5  |                                       |  |  |  |  |  |  |
| 1889 . . . . . | 45.2                   | 6.4                    | 41.9  | 5.4                                     | 0.9  | 3.2  |                                       |  |  |  |  |  |  |
| 1890 . . . . . | 56.2                   | 7.1                    | 49.5  | 0.6                                     | 0.8  | 2.9  |                                       |  |  |  |  |  |  |
| 1891 . . . . . | —                      | 4.1                    | —   | 0.4                                     | 0.6  | 2.9  |                                       |  |  |  |  |  |  |
| 1892 . . . . . | —                      | 5.1                    | —   | 3.4                                     | 0.6  | 2.4  |                                       |  |  |  |  |  |  |

This table shows that during the last 10—12 years iron smelting in Russia has almost increased 100 per cent and that the amount of foreign cast-iron used has decreased from 33 per cent in 1881 to 11 per cent in 1890, whilst the consumption of cast-iron has increased almost 50 per cent.

During the period under consideration, and in the same progressive manner as adopted with cast-iron, the Government has afforded increased protection to other branches of industry, such as coal mining, copper smelting, and chemicals.

Until 1884 coal and coke were imported free of duty through all frontiers except those of the Polish customhouses. In that year the first duties on these products were fixed, namely: at 2 copecks in gold per pound at the ports of the Black and Azov seas, and  $\frac{1}{2}$  a kopeck in gold per pound at the Baltic ports; whilst at the same time the duty on coal and coke imported into Poland, and all through the extent of the western overland frontier, was increased to  $1\frac{1}{2}$  kopecks in gold per pound. In 1886 the duty on the frontier of the Black and Azov seas was raised to 3 kopecks in gold per pound, and in 1887 a further protection was granted to the Baltic coast to the extent of 1 kopeck in gold, and to the western overland frontier of 2 kopecks in gold; and for the first time the duty on coke was increased one and a half times on account of its greater value and the fact that approximately  $1\frac{1}{2}$  pounds of coal are required to produce one of coke. It is necessary to observe that, along the overland frontier and the Baltic coast, it was found indispensable to impart the requisite stability to the duty on mineral fuel in conjunction with those measures taken towards fostering the native iron-smelting industry; and, in accordance with this, it was determined that the duty of 1887 should not be raised until January 1, 1898, that is, for the same period during which it had been decided not to lower the duty upon cast-iron.

The question of duties on copper has been repeatedly examined during the last decade. In 1882 the first protection was granted to rolling copper in the form of a higher duty on sheet copper, namely, 1 rouble in gold per pound, instead of 66 kopecks per pound for copper in bars and ingots; in 1885 the duty on copper was raised to 1 rouble 50 kopecks in gold for bars, and 2 roubles in gold per pound for sheet copper. Finally, in 1886, in consequence of the heavy fall in the price of copper abroad, on account of the glutting of the market, and the rapid growth of universal supply, especially its enormous development in the United States of America, a further increase of duty took place, namely, 2 roubles 50 kopecks in gold per pound on copper bars, and 3 roubles 10 kopecks on sheet copper. In addition to this, copper ores were subjected to the same duty as copper bars, in order to anticipate the possibility of introducing copper, deposited by the wet process, under the name of copper ore. The duty on copper goods was also increased in a corresponding manner, in order to avoid any undue advantage in importing goods instead of materials.

The following protective measures were taken with reference to chemical products and colouring matters. When the tariff was revised in 1882 the duty was raised, among other things upon calcined soda from 20 to 30 kopecks in gold per pound, caustic soda from 30 to 45 kopecks, bicarbonate of soda from 20 to 30 kopecks, glauber's salts from 10 to 15 kopecks, and alum from 20 to 25 kopecks in gold per pound; on acetic, citric, tartaric, tannic, and gallic acids from 2.20 roubles to 4 roubles in gold per pound, on chemical and pharmaceutical products, not especially denominated,

from 1 rouble 10 kopecks to 2 roubles in gold per pound. In addition to this, a duty was levied upon some goods which had previously been imported free, such as refined sulphur and flour of sulphur, at the rate of 10 kopecks in gold per pound, and potash at 30 kopecks per pound. Later on, the duty was raised on soda, alum, ammonia, salts of ammonium, and fuming sulphuric acid as follows: in 1886 the duty on soda and caustic soda was 40 to 60 kopecks in gold per pound respectively, on fused alum and sulphate of alumina, used instead of alum, from 25 to 30 kopecks, forming sulphuric acid from 22 to 60 kopecks in gold per pound. In 1887 the duty on ammonia, except sulphate of ammonia and ammonium salts, was raised from 22 kopecks to 1 rouble 20 kopecks, and on sulphate of ammonia from 22 to 50 kopecks in gold per pound. All these additional duties were levied for the purpose of arousing those chemical industries which possessed all requirements for independent development inside the country. Thus, the manufacture of soda, when the tax on salt was abolished, was enabled to use cheap raw material especially on the banks of the Kama in the government of Perm, and in the south. The protection given to the manufacture of ammonium salts was quite opportune, on account of the progress made by the gas works which furnished all the necessary materials, and also on account of the cheapness of hydrochloric acid, and enabled the dyeing and printing works to obtain materials of native manufacture. The stimulation of the alum manufacture by suitable duties was also indirectly a means of encouraging the production of sulphuric acid required for the preparation of alum and sulphate of alumina. The duty was also raised on dyeing materials, such as colouring extracts, from 1.50 to 2.50 roubles in gold per pound, on aniline and all other coal-tar dyes from 4.40 roubles to 15 roubles in gold per pound and on madder extract from 2.50 roubles to 15 roubles in gold per pound.

Other particular changes in the tariff made during the same period were carried out in the same progressive manner of developing native industries, as those made for the above-mentioned goods, and characterized by the transition from protecting the manufacturing trade, employing foreign raw material, to fostering the native production of material for manufacturing these goods, and stimulating the output of native raw material by a corresponding duty levied upon foreign raw material. Thus, in 1882 the duty on silk thread was raised without altering that on silk stuffs; in the same year a particular subdivision of the tariff was made, raising the duty on carded wool above that on raw wool, whilst they had previously been taxed alike; a higher protection was granted to carding in 1889; and the duty on raw wool was also raised, in order to protect native industry. As regards cotton yarn, the former tariffs had only levied a duty on the lower numbers, and this was now extended to the medium and high numbers, as well as twisted yarn and sewing cotton. With the view of fostering the working of the natural wealth of the country, export duties were levied on phosphorites, as the process of converting them into superphosphates encourages the chemical industry, and provides the necessary substances for fertilizing the agricultural soil; also on the slags from the Polish iron-works, as they can be used in the blast furnaces as coke, and thus lower the cost of iron smelting; and whilst they were exported free of duty, the price of slags at home increased; and on palm wood and walnut wood, in order to preserve the palm and walnut forests in the Caucasus.

Between 1877 and 1891 in addition to the protective measures in the general tariff already mentioned, some special measures were also put into force, having the result of safeguarding the interests of native industry, namely: 1. the closing of the transit beyond the Caucasus; 2. the regulating of commercial intercourse with Finland; 3. a temporary addition of 20 per cent to the duties in 1890.

I. The question of the transit beyond the Caucasus, that is, of the free import of foreign goods into Persia through the region beyond the Caucasus, has attracted the attention of the Government on several occasions, and according as it has been found beneficial or injurious to the country in general, and for trade and industry in particular, various measures have been taken, either towards facilitating and encouraging the transit, or else towards impeding or even closing it.

In 1821 permission was granted to import into the region beyond the Caucasus, during the space of ten years, all kinds of foreign goods with a payment of 5 per cent on their declared price; at the expiration of that term the European and colonial goods, imported into the region beyond the Caucasus, were subjected to the tariff of 1822, which was then in force in the Empire, with some modifications consisting in a considerable reduction in the duties upon goods which were not considered formidable to Russian competition; whilst other goods, as for instance cotton fabrics, were taxed much higher than those upon which duty was levied in Russia, that is to say, the duty was made completely prohibitive; the 5 per cent duty was only left for Asiatic goods imported from Persia and Turkey; and finally, the import of European goods from the country beyond the Caucasus into Russia was entirely prohibited. The regulations of 1831 remained in force in the country beyond the Caucasus until 1848, when followed the opening of a free transit of European goods into Persia from Redout-Kaleh and Soukhoum-Kaleh through Tiflis and Nakhichevan, and for Persian goods from Baku, through Redout-Kaleh and Soukhoum-Kaleh. In subsequent times various alleviating measures for transits were adopted, the principal of which was the augmentation of transit routes; thus, in 1864 transit traffic was also opened to Tiflis-Baku, and thence by sea to Persia, in addition to the already existing route of Tiflis-Dzhaulfa. Soon after 1880, the turnover of the trade traffic by the European-Persian transit through the region beyond the Caucasus amounted to 10,000,000 roubles per annum, and that of the goods traffic of the Russo-Persian trade to 12,000,000 roubles. About this time, in consequence of the termination of two sections of the Transcaucasian railway, connecting the Black and Caspian Seas with an uninterrupted railway line, the further existence of the Transcaucasian transit was called into question, and the Russian manufacturers made strenuous efforts to have it completely closed, for the following reasons: 1. on account of its favouring the establishment of a smuggling trade in foreign goods, in the region beyond the Caucasus and on the shores of the Caspian Sea, and thus hindering the sale of Russian goods there; 2. on account of facilitating the competition between foreign and Russian goods in Persia; 3. threatening Russian goods with a similar competition in Central Asia.

After careful consideration of the matter, the Government decided that these reasons were worthy of the greatest attention, especially in consequence of the imminent opening of through railway communication between Batoum and Baku, which would considerably facilitate and quicken the delivery of foreign goods in transit through the



region beyond the Caucasus; and by an Imperial mandate, dated May 13, 1883, the transit import of foreign goods through the above-mentioned country was stopped.

II. The commercial intercourse between the Russian Empire and the Grand Duchy of Finland was fixed by a special ratified decree on December 20, 1858. These regulations were the outcome of the further development of those rules, so frequently altered since the annexation of Finland to Russia, concerning this intercourse.

When in 1816, after the renewal of the interrupted political and commercial intercourse between the European powers, a new customs tariff for the Russian Empire was issued, containing essential changes in the prohibitive system prevalent up to that time; this tariff was bodily introduced into the Grand Duchy, and it was also decreed that, when foreign goods were imported from Finland into Russia, they would be liable to a second duty according to the general tariff, on condition that the owners of the goods would recover the duties paid by them into the Finnish customs. By the decree of May 9, 1817, the same rule was applied to foreign goods imported from Russia into Finland. The import of Russian goods into Finland, and that of Finnish good into Russia, were permitted free of any duty, but of the latter, only those which were mentioned in special registers, with a subdivision of such goods into those articles which might be imported without the presentation of a certificate proving their origin to be such, and those which required to be accompanied by such certificates.

When the tariff of 1822 was put in force in the Russian Empire, founded on the basis of the strictest protection, it was not extended to Finland, which in the same year received a special tariff of a comparatively moderate, conservative character. From that time the Grand Duchy and the Empire have not had any customs tariff in common, and the latest alterations in tariffs have been made separately in both countries, the Finnish tariff always differing from the Russian by a lower scale of duties. The inventories of Finnish goods imported free of duty into Russia have, in consequence of the assistance of the development of commercial intercourse between Russia and Finland, been repeatedly added to and enlarged; and, in addition to this, manufactured goods have been gradually added to the raw products and goods of the village industries, which they originally consisted of. The greatest facilities were afforded to the import of Finnish goods into Russia by the regulations of 1858, in which, amongst other things, the free, unlimited import of merchant iron, hoop iron, rails, and all paper mill produce, was permitted. These measures greatly tended to develop trade between the two countries; in 1858, the aggregate import and export turnover was 3,400,000 roubles, and in 1883 it rose to 31,200,000 roubles; towards the end of this period, however, the trade balance was not changed in favour of Russia, as for the 5 years between 1879 to 1883 the yearly export from Russia to Finland was equal to 11,900,000 roubles, or 1,600,000 roubles under the import from Finland to Russia.

As regards the different kinds of goods, it appears that the Russian export to Finland mainly consisted of provisions, to the extent of 55 per cent of the total export; then follow manufactured goods amounting to 26 per cent, and raw materials forming 19 per cent of the total. The principal item of import from Finland is, on the contrary, made up of manufactured goods, amounting to 55 per cent, then 30 per cent of raw materials, and lastly, 12 per cent of food-

stuffs. The amount of manufactured goods imported from Finland into Russia, and also of raw and half-wrought materials, not only constituted the principal part of the total import from there, but in a considerable measure exceeded the amount of manufactured goods and materials exported from Russia into Finland. Thus, in 1883, the amount of manufactured goods imported from the Grand Duchy into the Russian Empire was equal to 8,500,000 roubles, whilst the amount exported into Finland only reached 4,500,000 roubles; in the same year raw and half-wrought materials to the value of 5,000,000 roubles were imported into Russia, and only 3,500,000 roubles worth were exported from Russia. These figures show that, in consequence of the alterations in the conditions of trade and industry in Russia and Finland, and the measures taken here for protecting native industry, Finland, having the possibility of obtaining from abroad the implements of production and the raw materials duty free, or with a far lower duty than the Russian manufacturers, extracted far greater advantages than Russia from the regulations of 1858; and that the free import of Finnish goods into Russia might result, and prove detrimental to the development and success of Russian industry.

For this reason, in 1885 it was found necessary to alter the regulations referring to the import into Russia of those Finnish goods which formed the principal item of sale in Russia, and levy special regulating duties upon them, determined principally by the existing differences between the Russian and Finnish tariffs, in order to thus guard the Russian Empire from an overflow of certain Finnish produce, the manufacture of which might be receiving an artificial development in consequence of the difference in the customs duties.

These goods comprised: 1. writing and wall paper; 2. cast-iron, wrought iron, and steel, in the shape of raw materials and manufactured goods; 3. cotton fabrics and yarn; 4. dressed hides; 5. pottery, china, and glass. as the import of some of these objects began to assume very considerable proportions; for instance, in 1881 there were 565,000 pounds of paper imported, and 887,000 pounds in 1883; in 1881 there were 770,000 pounds of cast-iron and wrought iron imported, and 1,280,000 pounds in 1883.

When fixing the regulating duties for the class of goods already stated, the fact was taken into consideration that the difference in the expense of paying the duty on the foreign materials necessary in one or another branch of industry, did not exhaust all the advantages of some of the Finnish factories. In consequence of the more moderate duties in Finland on almost all foreign goods, the whole organization of the manufacturing trade was based differently to that in Russia; it was possible to start a factory on far less capital, and the cost of production was smaller. Finally, it was necessary to bear in mind that the district of Tammerfors, in which about 11 per cent of the manufacturing trade is located, enjoys until 1905 special privileges in obtaining materials and machinery from abroad duty free, in consequence of which the goods of the Tammerfors mills are much better able to compete with Russian wares.

On account of all these circumstances, the following protective conditions were fixed to the five categories of Finnish goods already mentioned: 1. writing paper was allowed to be imported in unlimited quantity, with a regulating duty corresponding, on the average, to the difference in the customhouse protection afforded by the

tariffs of that time to equivalent kinds of those goods in Russia and in Finland; 2. on the same basis regulating duties were fixed for china and glass ware, and the import of uncut and unground glass ware, and of a limited amount of china ware, to the extent of 30,000 pouds per annum, was permitted on payment of a duty lower than the general tariff; 3. regulating duties on dressed hides and cotton goods were calculated on the basis of the difference between the Russian and Finnish tariffs for necessary raw materials, such as cotton, raw hides, and tanning substances; besides this, the import of cotton goods was limited to 50,000 pouds per annum; 4. in the group of metals and metallic goods the most essential changes were made in the conditions under which they were imported into Russia, in accordance with those measures which were taken to encourage the native metallurgical industry. Until 1885, however, a limited quantity of wrought-iron material and goods, agricultural implements, and ships, were allowed to be imported free of duty from Finland.

In consequence of the considerable differences in the duties on cast-iron, iron blooms, ores, and mineral fuel in the Russian and Finnish tariffs, it was found practicable and profitable to bring into Russia from Finland not only iron of Finnish origin worked from native ores and pig iron, but even wrought iron manufactured at Finnish iron works from foreign ores or pig iron; and finally, foreign wrought iron blooms which had only been subjected to some slight treatment at the local ironworks. To counteract this irregular proceeding it was found indispensable to fix a regulating duty upon wrought iron materials imported from Finland, to the extent of 15 kopecks in gold per pound; this was fixed principally in accordance with the prevailing differences between the Russian and Finnish tariffs in the duty on cast-iron and blooms, and also to limit the import to 400,000 pouds per annum. The free import of cast-iron was, in general, prohibited, and an exception to this was only made in favour of the limited quantity of 400,000 pouds a year of cast-iron and blooms, made in the east of Finland from Finnish bog and lake ores, and with wood fuel. The amount of cast and wrought iron imported in excess of this quantity was subjected to the duty according to the general tariff. The importation of the following goods was permitted upon payment of a duty of 20 kopecks in gold per pound: a. sheet iron, wrought iron, and steel wares of any description, and iron castings, to the amount of 70,000 pouds per annum; b. machinery and instruments of all kinds, including agricultural and gardening implements, to the extent of 60,000 pouds a year. Finally, vessels of all kinds were subjected to duty according to the general tariff of Russia.

Lately, on account of further changes of a protective character having been made in the Russian tariff since 1885, which have had the result of increasing the difference between the Russian and Finnish tariffs, the question of changing the regulations referring to the import of Finnish goods into Russia has again arisen. The way has also been shown how to finally remove the difficulties which arise in commercial intercourse between the Grand Duchy and the Empire in consequence of the non-conformity of the tariffs: on the 21st of February of the present year 1893, an Imperial decree was issued to the Finnish Senate, commanding that measures should be taken to gradually raise the Finnish customs tariff so that it might in a few years, and in any case not later than 1905, be on a par with the Russian tariff.

3. The general raising of duties in 1890 was necessitated by the following

circumstances: since the introduction of duties in gold, the exchange of the gold rouble in paper kopecks remained constantly above 150 and during the period when the most important protective measures were taken, in 1888 and 1889, it attained 181 and 172, according to which exchange the scale of protective duties was calculated. At the same time, from the beginning of 1890 the value of the credit rouble abroad began to increase gradually, and in the month of August of that year the gold rouble was only equal to 129 paper kopecks. This marked improvement in the exchange, with the paper currency in vogue in Russia, would have occasioned a serious loss to native industry, had not corresponding measures been taken for the rise of the exchange lowered the price of foreign goods in the Russian markets, and facilitated the payment of duties upon them; and also, on the other hand, made it less advantageous to sell Russian goods for gold abroad.

It was therefore deemed expedient to raise the duties 20 per cent all round, and thus make them accord with the new state of the exchange rate; this was done by an Imperial edict, issued to the Minister of Finance August 16, 1890. In consequence of a general revision of customs tariffs having been already commenced at that time, these increased duties were only temporarily fixed until July 1, 1891. This increase was not levied upon coal and coke imported through the overland frontier and to the Baltic ports, upon coffee, cocoa, spices, tea and certain other articles, the taxation of which had a fiscal signification. On the other hand, the duty on coal and coke imported to the ports of the Black and Azov seas was increased to the maximum of 40 per cent, on account of the appearance of most unfavourable conditions in the competition of Russian with foreign coal, which, apart from the rise of the exchange, was also brought about by the lowering of import freights, and the lower price of coal in England.

| I N D U S T R I E S.                       | 1876.                      | 1890. | Per cent<br>of increase. |
|--|----------------------------|-------|--------------------------|
|  | In millions of<br>roubles. |       |                          |
| Cotton spinning and weaving . . . . .      | 102.7                      | 246.5 | 140                      |
| Wool spinning and weaving . . . . .        | 55.5                       | 105.6 | 90                       |
| Dyeing, printing, and dressing . . . . .   | 37.7                       | 97.5  | 160                      |
| Flax and hemp spinning . . . . .           | 20.1                       | 33.3  | 66                       |
| Silk weaving . . . . .                     | 8.2                        | 14.4  | 76                       |
| Paper making and wall papers . . . . .     | 9.8                        | 23.3  | 138                      |
| Chemicals, and colouring matters . . . . . | 5.5                        | 17.7  | 222                      |
| Tanning . . . . .                          | 26.6                       | 35.9  | 36                       |
| Glass and mirror making. . . . .           | 5.2                        | 11.5  | 120                      |
| Pottery and china. . . . .                 | 2.2                        | 4.1   | 86                       |
| Machine constructing. . . . .              | 43.4                       | 52.6  | 21                       |
| Total . . . .                              | 316.9                      | 642.4 | 102                      |

The return of the Russian customs policy to the strict protective system, during the period between 1877 and 1881, was accompanied by a marked development in the manufacturing industries of Russia, which may be seen in the preceding table, which shows the production of the principal branches of native manufacturing industry in 1876, previous to the introduction of gold duties, and to 1890.

#### FOURTH PERIOD, THE TARIFF OF 1891.

The piecemeal changes in the customs tariff, introduced during the period between 1877 and 1890, satisfied the most serious and urgent demands to protect native industries, and the time then arrived for a general revision of the customs tariff. This arose from various considerations. In the first place it was necessary to take further steps to develop the customhouse protection by fostering, winning and working of the necessary raw materials, by levying a duty upon raw materials brought from abroad. The wealth of Russia in the natural products of all three kingdoms of nature showed the opportuneness of such encouragement after substantial progress in manufacturing industry had already been attained. It was furthermore expedient to remove the unequal protection in various branches of native production, which had naturally resulted from the repeated all round increase in the tariff, and also to afford the fullest possible encouragement to the radical branches of native industry, which gave work to the inhabitants of vast tracts of the Russian Empire. Finally, the altered conditions under which goods were manufactured, and the appearance of new products in the market, necessitated changes in the editing of the tariff clauses.

The revision of the tariff had already been commenced in 1887, but this most complicated and responsible task engrossed the attention and labour of almost four years. First of all, with the assistance of specialists detailed information referring to Russian foreign trade was worked out, touching the introduction of foreign goods and the actual condition of the various branches of manufacture at home and abroad: and preliminary suppositions concerning the necessary alterations in editing the clauses of the tariff and the extent of the rates were drawn up. This matter was then handed over to be examined by consulting deputations of trade and manufacture, by the stock-exchange committee, and by companies engaged in commercial and industrial enterprises. The combined opinions of all these Councils and also petitions from private individuals concerning alterations in the tariff which they were desirous of having made, were examined by a Special Conference under the Presidency of the Minister of Finance, composed of members of the Ministry and professors of the St. Petersburg Technological Institute; and the new tariff scheme thus elaborated was discussed by a special committee, appointed by the Emperor, and also under the Presidency of the Minister of Finance. This committee was composed of members of different Government offices, representatives of trade, industry and agriculture, and technical specialists.

The new customs tariff was passed by the Council of the Empire, and ratified by the Emperor on June 11, 1891, and put into force on July 1, of the same year.

The following order was observed in grouping the clauses: the first 39 refer to the duty on articles of consumption; the second group, clauses 40 to 57 inclusive, includes furs, hides, leather goods, and also the products of animal life and their derivatives, such as, bones, glue, tallow, hair, et cetera. The third group, clauses 58 to 64 inclusive, principally consists of timber and wooden goods, and also plants, and wicker work of vegetable materials. The fourth group, clauses 65 to 78 inclusive, refers to the duties on building materials, polishing substances, goods made of ordinary clay or fire clay, pottery, faïence, and china and also glass ware, and mirrors. The fifth group, clauses 79 to 88 inclusive, comprises coal, naphtha, asphalt, various vegetable tars and their products. The sixth group, clauses 80 to 137 inclusive, consists of the materials and products of the chemical works in the broadest sense of that expression, and which may be subdivided into chemicals proper, cosmetics, lacquers, varnishes, dyeing and tanning preparations. The seventh group, clauses 138 to 175 inclusive, embraces ores and metals and metallic goods, also machinery and watches, clocks, musical instruments, equipages, cars and ships. The eighth group, clauses 176 to 178 inclusive, deals with the produce of the paper-making trade and printed matter. The ninth group includes the following 31 clauses, from 179 to 209 inclusive, and comprises spinning materials and the goods manufactured from them. Finally, the last and tenth group, clauses 210 to 218 inclusive, embraces hats, umbrellas, buttons, artificial flowers, jet, jewelry and other articles not mentioned in the other groups.

In general, the number of clauses of the tariff has been abridged from 253 to 226; out of this total the inventory of the goods which are allowed to be imported has been abridged from 241 to 218, that of the prohibited articles, from 12 to 8. The inventory of export goods paying duties retains its former number of clauses, namely 7.

The character and bearing of the alteration made by the tariff of 1891 will easily be seen in the following review of the principal of these changes, according to the separate groups of goods.

1. The chief alterations of a general character in the group of articles of consumption are directed towards raising the duty on certain products imported in a prepared state, ground, or pressed, and on others, if they are imported specially packed to the consignee, and generally denoting goods of a superior quality, such as mustard in small packets, starch, and salt in packets and boxes. In the taxation of salt, attention was given to the fact that the native salt industry had reached a considerable degree of development, and was able to compete with foreign salt on the shores of the Black and Azov seas with complete success. Accordingly, the former prohibition against the import of salt into the ports of the Black and Azov seas was annulled by the tariff of 1891, and a general duty of 20 kopecks in gold per pound on all frontiers was instituted, except for the ports of the government of Archangel, where the lower scale of 10 kopecks in gold per pound was retained. The differential duties on sugar through different frontiers were abolished on account of the small quantity imported; the prohibition against the import of grain beverages in barrels and large vessels was also annulled, and a duty of 12 roubles in gold per pound on the gross weight was fixed, in accordance with the inland excise. Finally, in order to encourage the home production of strong wines, similar to those of Spain and Portugal, in addition to the duty by weight of 4 roubles in gold per pound gross,

a supplementary duty on wines containing over 16° of alcohol was fixed at 12 kopecks in gold for every degree above that quantity.

2. With reference to the group of hides, leather goods, furs, and animal products, the fact was taken into consideration that usually very thick hides are imported, and which the Russian cattle are not able to yield on account of climatic and natural causes, and therefore high duties on such hides would not extend any protection to native rural economy, and would only be an obstacle to the manufacturers using them. The duties, therefore, on undressed hides were left as they were before the addition of the 20 per cent. The more costly kinds of dressed leather, kid, morocco and chevrette, were subjected to a higher duty of 15 roubles gold per pound, which was also extended to small, varnished skins, previously admitted on the same terms as large skins; the duty on ladies boots, and shoes of chevrette was also correspondingly increased to 2 roubles gold per pound, and on other kinds, to 1 rouble gold per pound, instead of the former rates of 1 rouble 45 kopecks, and 70 kopecks gold per pound respectively. As regards the other varieties of dressed hides, in consequence of the very small quantity imported it was considered sufficient to make only a slight increase to the duty in force, until August 16, 1890. Then the various leather goods, upon which previously the same duty had been paid, were divided by the new tariff into two classes, saddlers goods being subjected to a lower duty, and trunks and portmanteaux being charged dearer. Finally, such articles as had more the character of half-wrought materials, such as straps and stitched uppers, were rated at a medium duty between those of dressed hides and leather goods. The duties on tanning substances were examined with reference to protecting the leather industry. In accordance with the fundamental principles of the tariff revision, those tanning substances imported in the form of powder were subjected to a higher duty in order to cooperate with the introduction of their pulverization into Russia. The duty on tanning substances, imported in their natural condition was lowered from 7 to 5 kopecks gold per pound, in the interests of the development of the leather trade. In a like manner, the duty on tanning extracts, such as chesnut, hemlock, which have a wide application in that business, was lowered from 2 roubles 50 kopecks to 30 kopecks gold per pound.

The duties on the more costly kinds of furs were raised, and the distribution of the furs according to the separate paragraphs of the clause was altered, in order to determine in the most exact manner the co-relation between the duty and the value of the fur.

3. The principal alterations made in the group of timber, wooden, and basket-work goods were: common kinds of wood, squared up and sawn, were subjected to duty, in order to protect native wood working; the duties on carpenters and coopers work were raised. With regard to basket-work goods, the rates of duty were made to correspond closely with the cost and excellence of the workmanship of the article; so that instead of the two scales of the former tariff, one very low, at 18, 24, and 55 kopecks gold per pound according to kind, and the other exceedingly high, at 1 rouble 5 kopecks gold per pound, several intermediary rates at 60 kopecks, 5 roubles, 15, 25, and finally, 40 roubles gold per pound, were fixed. A further sensible protection was afforded to the higher classes of joiners and turners work. The duty on furniture was largely increased; according to the former tariff it had been

imported as joiner work, adding 25 per cent for the trimmings; according to the tariff of 1891, furniture covered with linen or having cane bottoms, pays a duty of 6 roubles gold per pound, and if covered with stuff or leather, 10 roubles per pound. Moreover, as beech furniture is being much imported, an increased duty is laid on the ready-made articles as well as on the separate parts of that kind of goods, not to encourage the import of foreign materials.

4. In order to protect the home materials used in the ceramic industry, a duty is levied upon the foreign raw materials, as follows: clay used in manufactures, and in architecture, and formerly imported free, 2 kopecks per pound; such materials as gypsum in pieces, fat calx, and burned chalk, formerly only taxed on the Baltic borders, 3 kopecks per pound. In like manner the duty on cement, on some articles of earthenware, fire clay, glazed brick, and majolica has been increased. Instead of the two, graded duties on pottery, one of 26 kopecks, and the other of 1.30 roubles per pound, three progressive duties have been levied, namely 30 kopecks, 75 kopecks, and 1.50 roubles per pound, according to the value of the goods.

In the glass industry it has been especially noticed that there has been a considerable import of fine glass ware, and of mirrors of small dimensions, and that the development of the home manufacture of looking-glasses has been slow, notwithstanding that the duty laid on foreign mirrors is considerable. In order to do away with the first condition, unfavourable to Russian industry, the duty on foreign glass ware and on small mirrors has been increased. The reason of the small development in the production of Russian sheet glass seemed to lie in the former tariff, according to which the duty on polished sheet glass differed much from that laid on the unpolished; the first was imposed according to the dimensions of the surface, and the second according to weight. For this reason the polishing of foreign glass became a prominent business in Russia. In order to remove such an irregularity in the Russian industry, it was found necessary to tax the raw material also according to the superficial dimensions, and to make the difference between the duty on raw and polished glass so small, as to render the working of foreign material unprofitable.

5. In the tariff of 1891 special attention was paid to chemical goods especially so, as according to the tariff of 1868 the chemical industry was considered of secondary importance, and therefore the duty on chemicals was very small, and so remained until 1891.

Great changes have been made in the duties of the following chemical goods: on potassium chlorate, and sulphate, as well as on the crude chloride of potassium which was admitted free until the tariff of 1891 laid a duty on it of 15 kopecks per pound; a duty of 20 kopecks per pound was levied on raw naphtha, phenol, and benzine; and that on anthracene, which was formerly 2.40 roubles, was decreased to 20 kopecks per pound. The lowering of the duty on anthracene, simultaneously with the raising of that on anthraquinone, from 2.40 to 4 roubles gold per pound, tended to encourage the production of alizarin from anthracene and not from anthraquinone which is a half-manufactured product. In order to encourage the working of Russian sulphur, which exists in great quantities in the Empire, and to force Russian manufacturers to make sulphuric acid from sulphur pyrites, which would cheapen much the fundamental material of all chemical works, a duty was imposed by the tariff of 1891 on raw sulphur. But, as the principal Russian sulphur deposits are in Dagestan



and the Transcaspian regions, from which only the southern governments can be supplied, the duty on sulphur, 5 kopecks per pound, is established only for the ports of the Black and Azov seas; for the other frontiers the duty is only 2 kopecks per pound, the motive being not to lay too great a burden on the chemical industry, which has great need of this product. For producing sulphuric acid from pyrites much expense and time must be laid out before the manufactories are adapted to the work; furthermore, much depends on the distance of the works from the pyrites deposits, on the convenience of transport, on the quantity of brass contained in the pyrites, and on other kindred circumstances. In order to encourage the development of products which serve as manure, much needed for agriculture especially in the non-*chernoziom* regions, the import of such materials, as well as of raw bone and unground scoria, remains duty free also in the tariff of 1891; but raw bone and ground scoria are taxed 2 kopecks per pound gross; hyperphosphates, bone cleaned with sulphuric acid, and fertilizing powders, have a tax of 5 kopecks per pound gross; and finally, burnt bone, bone ash, and bone coal pay the highest duty, namely, 12 kopecks per pound gross. Wine stone, or tartar, which is secured in Russia in abundance at the wine manufactories, is subject to different rates of duty, dependent on the quality. The duty imposed thereon is specially calculated, in order to maintain, on the one hand, the home production, and on the other, not to encourage the importation of the raw material. The duties are rated as follows: on crude tartar, from 0.26 to 0.60; on purified, from 0.26 to 2.40; on cream of tartar, from 2.40 to 4; and on tartaric acid, from 4 to 5 roubles gold per pound. Although in 1868 the duty on bicarbonate of soda was raised from 15 kopecks, and that on calcinized from 30 to 40 kopecks, thus decreasing the import; however, as the home production was still very considerable, about 700 pounds yearly, the duty on soda was raised in 1891 from 40 to 55 kopecks per pound. Moreover, the foreign product, owing to its manufacture abroad, was sold at a price too high for the Russian consumer. The establishment of a home soda manufactory, especially if according to the method of Leblanc, would be of very great importance to Russia, the more so as by that method important chemical products may be obtained.

Chloride of lime pays a duty of 70 kopecks per pound under the tariff of 1891, whereas the former duty was only 44 kopecks; this increase was made to protect the manufacture of soda in the Empire. In taxing vinegar powder, the duty to be imposed on vinegar itself was taken into consideration. Russia has all the conditions necessary for producing vinegar powder; nevertheless, during the preceding tariff, a reproduction of foreign powder took place in Poland. Many chemical and apothecary goods, not mentioned separately, paid a duty of 2.40 roubles gold per pound. But it was discovered that products of very different value were taxed alike, and that for some of them the duty of 2.40 roubles was too small. Therefore, in 1891, products requiring a higher duty were taxed separately, thus: silver, gold, and platinum salts, 8 roubles gold per pound; benzoic, tannic, citric, salicylic, sulphuric, chromic, gallic, and pyrogallic acids, 6 roubles gold per pound. In the wood production, special effort has been made to encourage the manufacture of white resin, the duty on which is increased from 13 to 40; and on turpentine, from 40 to 60 kopecks per pound, as the getting of products from wood by dry distillation was one of the most ancient industries of Russia, especially developed in the rich forest regions of the north-eastern part of

the Empire. To protect such ancient industries was one of the principal aims of the tariff of 1891. The duties on colouring materials and dye stuffs have not been subject to such great changes as the other sections of the chemical group, statistics having shown that dyestuffs, print-stamps and the like, so much developed in Russia of late years, have been supplied by home production. The duty has been increased on some preparatives, which have a great trade importance, and the home production of which would be very desirable, for example: on artificial pigments, produced during the distillation of gas tar, the duty is raised from 15 to 17 roubles gold per pound; ultramarine and smalt in powder, from 2.65 to 3.30 roubles gold per pound; verdigris and other brass colours, the duty on the former being raised from 3.30 to 4, and for other colours, from 2.20 to 4 roubles gold per pound.

6. In the mineral-fuel group the following changes have been made: sulphur pyrites have been taxed 1 kopeck gold per pound, in order to encourage the home production, as they are indispensable in the making of sulphuric acid. To prevent the import of such sulphur pyrites as serve for melting copper, the rule has been established, that the above mentioned duty is imposed only on such pyrites as do not contain more than 2 per cent of pure copper, and those that contain more are taxed two and one-half kopecks per each per cent of copper. The same duty is imposed, under the tariff of 1891, on copper ores, and copper scoria, namely, two and one-half kopecks per each per cent of pure copper per pound.

Above it has been explained why the duty on stone coal and coke was temporarily raised in 1890, in the southern ports, to 40 per cent, so that on stone coal it formed 4.2, and on coke, 6.3 kopecks gold per pound. After the reconstruction of the tariff the duty on coal and coke was left unchanged until July 1, 1892, when, owing to the fact that the coal trade was not founded in the south on absolutely firm foundations, the duty on stone coal was fixed at 4, and on coke at 6 kopecks per pound.

7. In the metallic group the greatest attention was paid to cast-iron. As the duty of 1887 was found insufficient to limit the import, especially when the rate of exchange became high; and as, since the imposition of a duty on foreign cast-iron, the home production began to develop, it was thought advisable to increase the tax on that important metal to 20 per cent, comparatively to that fixed in 1890. Thus, this duty was 30 kopecks gold per pound on cast-iron imported by sea, and 35 kopecks on that imported over the western overland frontier. On special sorts of cast-iron, such as manganesic, silicious and chromic, owing to the high price of such manufactures and to their great development in the metallurgical industry, a duty of 50 kopecks per pound was levied.

The duty on iron and steel has also increased, conformably to that on cast-iron. According to the tariff of 1891, the highest duty was imposed on some sorts of cast-iron, which was formerly the same as on assorted, and on fine sheet iron, above No. 25, according to the Birmingham gauge. The latter regulation tended to encourage the home production of tin, which, during the former tariff, owing to the small duty on foreign tin, and on fine sheet iron, was principally manufactured from foreign iron.

8. The duty on machines, the production of which has developed in Russia much slower than the other industries, was raised but little, in order not to embarrass

the growth of such industries as use machines. This duty, imposed in 1890, was 20 per cent higher than the former. The increased duty on farming implements, in 1890, was found too high, owing to the difficult position of the agricultural industry in Russia; therefore the duty on such machines was left the same as in 1887, namely, 70 kopecks per pound. For the same reason the duty on steam thrashing machines was decreased from 2 to 1.40 roubles per pound. The same duty was fixed also on scythes, sickles, shears, rakes, shovels and the like; and also on hand instruments for different trades, arts, factories and works, in order to make the acquisition of these useful machines more easy.

9. In fixing the duty on spinning materials and on spun articles, it was taken into consideration that ready products from such materials were sufficiently taxed under the former tariffs, and that it was only necessary to take measures for developing the home production of raw material and of half-manufactured goods.

In order to maintain the cotton industry in the regions of Central Asia, the duty on raw cotton was increased, according to the tariff of 1891, from 1 to 1.20 roubles, and through the overland frontier, from 1.15 to 1.35 roubles gold per pound. In 1893 it ranged from 1.40 to 1.55 roubles gold per pound. As to jute, which is a constant competitor with the local spinning materials, the duties on the raw fibre and on jute tissues were fixed in closer relation than in the former tariffs, when the manufacture of stuffs from foreign jute was much developed. In the wool industry the growth of the production of combed wool in ribbons, greatly needed in the making of tissues from raw wool, was especially taken in consideration in 1882, and the tendency of the tariff of 1891 was also in the same direction. During the former tariffs, owing to the fact that the duty on raw wool, combed wool and woollen tissues was the same, the import of combed wool increased. But, as explained above, the encouragement of the home production of combed wool is of very great importance, not only to spinning mills, in order that they should not be dependent on foreign half-manufactured materials, but also to the home industry of sheep farming, which produces a sufficient quantity of raw wool for combing. Therefore, the relation between the duties imposed on wool, raw and combed, and in tissues, has been changed in the tariff of 1891, in such a manner that the difference between the duty on combed wool and woollen stuffs is lessened, and that between the duty on raw and combed wool increased. This object was obtained by preserving the former duties on raw wool, which was 2 roubles, and on tissues, 9 roubles per pound, and by increasing the duty on combed wool from 4.50 to 5.50 roubles per pound.

In the tariff of 1891, measures were taken to develop the silk-twisting industry in Russia, in order to protect the silk-spinning mills, which were dependent on the foreign producers of twisted silk. Therefore, the duty on undyed silk tissues was increased from 16 to 40, and on dyed tissues, from 32 to 56, roubles gold per pound. But not to overburden the Russian silk-spinning industry by raising too much the prices of materials, so long as the silk-twisting mills are not sufficiently developed, it was found necessary to gradually increase the duty on silk, as follows: until July 1, 1893, 30 and 40 roubles per pound, and thereafter, to impose the full duty fixed in the tariff of 1891.

From the foregoing it is seen that the new tariff tends principally to encourage in a uniform manner all the branches of Russian industry in its different stadia, from

raw and half-wrought materials, to valuable manufactured goods. The duty has been considerably increased only on certain articles, namely, on such as were not sufficiently taxed to restrain their import. The advancing of the duties had no fiscal aims; on the contrary, in many cases, when the duty was found too high compared either with the value of the goods, or with the development of the industry, it was lowered, especially as compared with the duties which were fixed by the Imperial statute of August 16, 1890.



## CHAPTER XXIV.

## Review of foreign trade.

## GENERAL AND SPECIAL TRADE OF THE EMPIRE.

In the general trade of Russia, including the Grand Duchy of Finland, the import in 1891 amounted to 414,000,000, and the export, to 751,000,000 paper roubles. These figures are distributed as follows: from abroad, 390,000,000 paper roubles, of which 24,000,000 roubles worth were imported to the different governments of Finland; the export of goods, 722,000,000 paper roubles, of which 17,000,000 paper roubles worth were sent from Finland; the return of consigned exports, 1,000,000 paper roubles; the return of consigned imports, 6,000,000 paper roubles; the transit of foreign goods through the Empire, 4,000,000 paper roubles; the transit of Russian goods through foreign countries and coastage, 19,000,000 paper roubles.

In the special trade, together with Finland, the import amounted in 1891 to 384,000,000, and the export, to 721,000,000 paper roubles.

Data showing the foreign trade of Finland, and which form a separate accountability, are given below by themselves. Excluding them, and considering Finland as a separate customhouse, the totals of the foreign trade of Russia itself are represented on the average, from 1886 to 1891, by the following figures: in the general trade the import was 425,000,000, and the export 702,000,000 paper roubles worth; in the special trade the import amounted to 405,000,000, and the export to 682,000,000 paper roubles. The yearly average export exceeds the import by 277,000,000 paper roubles. The mentioned figures are formed from the following: the import of foreign goods, including those of Finland, amounted to 410,000,000 paper roubles; the export of Russian goods abroad and to Finland, 683,000,000 paper roubles; the return of consigned imports 5,000,000, and the return of consigned exports, 1,000,000 paper roubles; the transit of foreign goods through the Empire, 4,000,000, and the transit of Russian goods through the foreign countries, and coasting, 10,000,000 paper roubles.

From 1886 to 1891 the import through the different customhouses of the frontier was as follows: through the West European frontier, 86 per cent.; through the Black Sea border of the Caucasus, 2 per cent; through the Irkutsk customhouse, 5 per cent.; through the other Asiatic customhouses, 4 per cent, and to Finland, 3 per cent. These figures show the predominating importance of the West European frontier, which is also seen in the figures representing the export trade, thus: goods exported through the West European frontier form 90 per cent of the total export; through the Black Sea border of the Caucasus, 6 per cent; through the other customhouses of the Asiatic frontier, 2 per cent, and to Finland 2 per cent.

## FOREIGN TRADE OF EUROPEAN RUSSIA.

### *General totals.*

Since the abolition of the customhouse line between the Polish and the other governments of European Russia, in 1851, the frontier of the Empire has undergone little changes in the south-western border; and, therefore, data showing the development of the foreign trade, during 42 years, from 1851 to 1892, in relation to the territories they embrace, may be relatively compared. After the construction of the Vladikavkaz Railroad a close connection ensued between the northern Caucasus, which forms part of Asiatic Russia, and the region round about the Azov sea, which is in European Russia. Therefore the former limits between European Russia and Asiatic were found to be somewhat incorrect, until the construction of the Novorossisk branch of the Vladikavkaz railroad, which became the principal port of the Northern Caucasus. In valuing the yearly turnover of Russian trade it is necessary to have in view, that the price of goods was fixed on the basis of the paper rouble, which is subject to considerable fluctuations in the rates of exchange; therefore, it is useful to mention, alongside of the former prices, the yearly totals in roubles gold, according to the rate of exchange of the given year, in order to be able to judge of the fluctuation in the turnover of trade during a longer period.

The yearly average import during eight five-year periods, from 1851 to 1890, was consecutively as follows: 74, 127, 138, 265, 427, 483, 480, 375 million paper roubles, or on the average, 294 millions; and in million roubles gold: 74, 120, 121, 212, 364, 326, 304, 224, or on the average, 218 millions.

In 1891 and 1892 the import did not exceed, in 1891, 326,000,000 paper, or 220,000,000 gold roubles; and in 1892, 347,000,000 paper, or 219,000,000 roubles gold. Thus it is seen that the paper rouble value of the import trade, having attained its highest limit during the five years, from 1876 to 1880, gradually decreases and falls to its minimum in 1891.

But the value of the export trade increased gradually until the nineties, as is seen from the following: the yearly average export during the eight five-year periods, from 1851 to 1890, was consecutively 81, 150, 161, 240, 356, 513, 546, 606 millions, or on the average, 332 million paper roubles, and in roubles gold: 81, 141, 140, 192, 303, 345, 346, 380 millions, or on the average 241 million roubles gold. In 1891 the export amounted to 627 millions paper, or 423 millions gold; and in 1891, 400 million paper, or 252 million roubles gold.

Such considerable fluctuations in the trade turnover can only be explained by examining a great number of different economic conditions of the Empire. According to information found in the reports on the foreign trade of Russia, it may be observed that the character of the commercial relations of Russia with other countries is very different from what it was in the middle of the century, and that Russian trade has attained great development. Thus, in 1851 the value of goods exported through the West European frontier was about 84,100,000, and in 1891 it amounted to 627,300,000 roubles paper; in other words, it increased seven and one-half times; moreover, the value of breadstuffs formed, in 1851, 25 per cent of the total export, and in 1891, 51 per cent. The percentage of the following goods increased in the total value of the export, as follows: forest goods, from 5 to 7 per cent; cow butter, from 0.1 to 1 per cent; fish and caviar, from 0.3 to 1 per cent. The export of some other goods has also increased, although the total value of the export has remained the same, for example: flax, from 3,000,000 pounds, in 1851, to 12,600,000 in 1891; hemp, from 3,000,000 to 3,900,000 pounds; wool, from 600,000 to 1,900,000 pounds: flax, and other seeds, from 10,100,000 to 23,700,000 pounds. Of special importance is the fact, that in 1891 such goods were exported which in 1851 were either imported, or did not form articles of the export trade, as, sugar, spirits, phosphorus, mercury, malt, all sorts of meat, oil, and naphtha products.

In close connection with the preceding is the decrease in the import of a great number of goods, especially of manufactured articles. In the total increase of the import, from 87,100,000, in 1851, to 326,300,000 roubles paper in 1891, increased also the relative import of: hemp, from 11 to 24 per cent; metals unwrought, from 2.3 to 7 per cent; articles in metal, including machines, from 5 to 10 per cent; wool, from 2 to 5 per cent. The import of cotton productions decreased from 2,000,000 to 1,300,000 paper roubles; and silk productions, from 4,000,000 to 1,200,000 paper roubles. The import of tea increased considerably, owing to the permission, in 1862, of bringing it through the European frontier. There was practically no export of tallow, iron, copper, and potash.

The general turnover of the foreign trade through the West European frontier averaged, from 1886 to 1890, 963,000,000 roubles paper, or 604,000,000 roubles gold, of which the export formed 606,000,000 roubles paper, or 380,000,000 roubles gold; and the import, 357,000,000 roubles paper, or 224,000,000 roubles gold, that is, a little more than one-third of the total turnover. The export exceeded the import by 249,000,000 roubles paper, or 156,000,000 roubles gold, that is, the import formed two-fifths of the export.

The different goods exported may be represented as follows: foodstuffs, 60 per cent; raw and half-wrought materials, 35 per cent; animals, 2 per cent; manufactures, 3 per cent. Goods were imported as follows: foodstuffs, 17 per cent; raw and half-wrought materials, 64 per cent; manufactures, 19 per cent.

The average export exceeded that of the import, from 1886 to 1890, in foodstuffs, by 305,000,000; in animals, by 11,000,000 paper roubles. The average import, on the contrary, exceeded that of the export, in raw and half-manufactured goods, by 16,000,000, and in manufactures, 51,000,000 roubles paper.

In 1891 the quantity of foodstuffs exported amounted to 381,100,000 roubles

paper; of raw and half-wrought materials, 209,800,000; of animals, 15,800,000; of manufactured articles, 20,600,000 roubles paper. The same year were imported: foodstuffs, 54,300,000 roubles worth; raw and half-wrought materials, 203,200,000; animals, 300,000, and manufactured articles, 68,40,0000 roubles paper. Thus, in 1891, notwithstanding the fluctuation in the figures, the relation between the different exports, as well as the imports, did not change materially as compared to that of the preceding five years, except that the export of raw materials exceeded their import: as well as that of half-manufactured goods. Taken separately, the goods exported exceeded, on the average, the amount of those imported, as follows: foodstuffs, 309,000,000, and animals, 13,000,000 paper roubles; for half-manufactured materials the import was on the average greater than the export by 13 millions, and for manufactured articles, by 50,000,000 roubles paper. The latter difference was in 1886, 54,000,000; in 1887, 236,000,000; in 1888, 396,000,000; in 1889, 313,000,000; in 1890, 249,000,000; and in 1891, 301,000,000 roubles paper. From the above it is seen that the dependence of Russian trade on foreign import rapidly decreases.

The general turnover of the trade, that is, the total of the export and import through the West European frontier was on the average, from 1886 to 1890, 963,000,000 roubles paper, which were distributed on the separate parts of that frontier as follows: on the border of the White Sea, 1 per cent; the Baltic, 35 per cent; on the western overland frontier, 30 per cent; and on the southern border, 34 per cent. Thus, notwithstanding the special development of trade in Odessa, the Baltic frontier has until now a predominating importance to the foreign commerce of Russia. The trade balance in the separate parts of the West European frontier is not uniform: thus, on the White Sea border, the export exceeds, on the average, the import by 5,000,000; on the Baltic, by 16,000,000; on the western overland frontier, by 21,000,000; and on the southern, by 207,000,000 paper roubles. From the above it is seen that the southern frontier is of the greatest importance to the Russian trade balance.

By comparing the value of the export with that of the import in the different parts of the West European frontier the following results will be obtained: the import forms 17 per cent of the export over the White Sea border; 91 per cent, through the Baltic frontier; 87 per cent, on the western overland; 22 per cent, on the southern; in other words, on the White Sea and southern frontiers the export especially exceeds the import. These results are confirmed by the figures which show the total quantity of goods imported and exported through the different parts of the West European frontier. The export through the latter frontier, from 1886 to 1890, was 410, 557, 753, 690 and 639 million pounds; and the import, 206, 176, 184, 217, and 198 million pounds. The weight of goods imported through the White Sea frontier formed on the average, during the above mentioned five years, 7 per cent; through the Baltic, 58 per cent; through the western overland frontier, 42 per cent; and through the southern, 9 per cent of the exported goods.

From the above mentioned relations may be noted the following exceptions: the Baltic border, through which the import of cheap goods, such as coal, predominates; and the western overland frontier, through which valuable goods are imported.

The goods imported through the different parts of the West European frontier form the following per cent of the total: through the White Sea border,



1 per cent; the Baltic, 60 per cent; the western overland, 27 per cent; and the southern, 12 per cent. The quantity of exported goods is on the same frontiers as follows: 2, 33, 21 and 44 per cents respectively. From these figures it is seen that the weight of goods of the foreign trade, in the separate parts of the frontier, does not correspond with the value of those goods. In all these frontiers the quantity, as also the value of the export, exceed the import. This is largely due to the fact that the ships come into the Empire generally in ballast, and depart laden with cargoes, and that on the overland frontier a more intensive activity is observed in railways, going to the foreign frontier, than in those returning therefrom.

The annual totals of different goods imported, from 1883 to 1890, were as follows: herrings, 4,000,000 to 6,000,000 pounds; other foodstuffs, 7,000,000 to 20,000,000; coal and coke, 96,000,000 to 136,000,000; cotton, 6,000,000 to 10,000,000; cast-iron 4,000,000 to 19,000,000; iron, 3,000,000 to 6,000,000; other raw and half-wrought materials, 37,000,000 to 48,000,000; and manufactures, 7,000,000 to 13,000,000 pounds. The quantity of coal imported is the most considerable; with this exception, the weight of the other goods, imported from 1883 to 1890, fluctuated between 78,000,000 and 106,000,000 pounds, amounting on the average, during the 4 years from 1883 to 1886, to 96,500,000 pounds, and in the four-year period, from 1887 to 1890, to 85,250,000 pounds, that is, it decreased 12 per cent; this was influenced, among others causes, by the results of the Government tariff. The total weight of all the goods, exported from 1883 to 1890, fluctuated between 410,000,000 pounds, in 1886, to 753,000,000, in 1888; on the average during the 4 years, from 1883 to 1886. 483,000,000 pounds were exported, and the following four years, from 1887 to 1890, 660,000,000 pounds, that is, 27 per cent more.

Among exports cereals always occupied the first place, and formed, during the mentioned 4-year periods, on the average, 65 to 66 per cent, that is, about two-thirds of the total export; the second place was occupied by forest goods.

The principal articles imported, from 1886 to 1890, were of foodstuffs: groceries, 1,385,000 pounds, to the value of 29,993,000 roubles paper, of which tea forms 753,000 pounds, worth 19,330,000 roubles; coffee, 380,000 pounds, worth 5,134,000 roubles; tobacco, 65,000 pounds, worth 3,244,000 roubles; herrings and other fish, 6,254,000 pounds, to the value of 8,657,000 roubles; wine, 520,000 pounds, 7,623,000 roubles worth; vegetables and fruit, 2,594,000 pounds, valued at 6,805,000 roubles; cheese, 40,000 pounds, worth 702,000 roubles; rice, 158,000 pounds, 552,000 roubles worth; mineral waters, 144,000 pounds, 477,000 roubles worth; salt, 1,091,000 pounds, 372,000 roubles worth. Of raw and half-wrought materials: cotton, 8,162,000 pounds, 78,660,000 roubles worth; drugs, 5,515,000 pounds, 43,138,000 roubles worth; wool, 620,000 pounds, 20,454,000 roubles worth; coal and coke, 109,408,000 pounds, 13,064,000 roubles worth; cotton tissues, 230,000 pounds, 9,161,000 roubles worth; silk, 34,000 pounds, 8,978,000 roubles worth; iron, 3,921,000 pounds, 8,025,000 roubles worth; plants and grain, 2,064,000 pounds, 5,634,000 roubles worth; cast-iron, 8,353,000 pounds, 5,060,000 roubles worth; wrought leather, 96,000 pounds, 3,332,000 roubles worth; lead, 1,181,000 pounds, 2,781,000 roubles worth; forest goods to the value of 2,774,000 roubles; unmanufactured leather, 436,000 pounds, 2,611,000 roubles worth; steel, 710,000 pounds, 2,564,000 roubles worth. Of manufactured articles: machines and apparatus, 1,722,000 pounds, 16,263,000 roubles worth; iron and steel articles, 1,209,000 pounds, 11,044,000 roubles

worth; woollen, 39,000 pounds, 3,054,000 roubles worth; cotton, 32,000 pounds, 1,944,000 roubles worth; glass, 116,000 pounds, 1,748,000 roubles worth; silk, 4,000 pounds, 1,593,000 roubles worth; paper, 97,000 pounds, 1,210,000 roubles worth; cast-iron, 217,000 pounds, 936,000 roubles worth; faience and china, 37,000 pounds, 663,000 roubles worth.

During the same years the principal articles of export were of foodstuffs: grain, 397,418,000 pounds, 322,434,000 roubles worth; sugar, 3,237,000 pounds, 12,159,000 roubles worth; eggs, 574,000,000 pieces, 9,403,000 roubles worth; spirits and corn-brandy 4,205,000 pounds, 7,418,000 roubles worth; fish and caviar, 650,000 pounds, 4,300,000 roubles worth; cow butter, 335,000 pounds, 3,458,000 roubles worth; different meats, 242,000 pounds, 1,287,000 roubles worth; tobacco, 128,000 pounds, 1,070,000 roubles worth; and papirosses, 21,000,000 pieces, 203,000 roubles worth. Of raw and half-manufactured materials: flax and tow, 11,549,000 pounds, 57,064,000 roubles; forest goods, to the value of 39,428,000 roubles; oil grain, 25,307,000 pounds, worth 32,800,000 roubles; hemp and tow, 3,685,000 pounds, 17,829,000 roubles worth; wool, 1,845,000 pounds, 17,590,000 roubles worth; bristles, 155,000 pounds, 8,504,000 roubles worth; leather, 450,000 pounds, 5,503,000 roubles worth; naphtha products, 4,964,000 pounds, 5,436,000 roubles worth; oil, 6,791,000 pounds, 5,143,000 roubles worth; and furs, 292,000 pounds, 4,496,000 roubles worth.

#### THE IMPORT AND EXPORT THROUGH THE PRINCIPAL CUSTOMHOUSES.

Owing to the great extent of the frontier, it is necessary to examine through which points the greatest quantity of goods has been transported. Investigations show that these points are such customhouses as are situated at the extreme points of the Russian railways.

*St. Petersburg Seaport Customhouse:* The value of the import by sea was during the consecutive years from 1886 to 1890 as follows: 59.1, 58.7, 59.5, 67.9, 72.3, or on the average, 63.5 million roubles, of which foodstuffs formed 16 per cent; raw and half-wrought materials, 70 per cent, and manufactures, 14 per cent. The value of the export by sea, during the same years, amounted consecutively to: 59, 55.3, 60.9, 58.2, 51.4, or on the average, 56.9 million roubles, of which, foodstuffs formed 59 per cent; raw and half-wrought material, 38 per cent; and manufactures, 3 per cent. The average import exceeds the export by 6,600,000 roubles; foodstuffs were exported to the value of 23,300,000 roubles more than the import; of raw and half-wrought materials the import exceeded the export by 22,900,000, and that of manufactures, by 7,000,000 roubles. The total weight of goods exported amounted on the average during the abovementioned years, to 53,100,000, and that of goods imported, to 74,200,000 pounds. Of foodstuffs the principal articles exported were: grain, 41,263,000 pounds; meat, 5,000 pounds; eggs, 30,000,000 pieces; cigarettes, 3,000,000 pieces. The articles imported were: cheese, 21,000; herrings and other fish, 594,000; groceries, 228,000; grape wine, 153,000; mineral waters, 40,000 pounds. Of raw and half-wrought materials were principally exported: lumber, to the value of 583,000 roubles; different grain, 3,355,000 pounds; oil, 1,074,000 pounds; flax and tow, 1,487,000; hemp and tow, 110,000; skins, 58,000; leather, 23,000; different

kinds of hair, 37,000; feathers and down, 14,000; wool unspun, 123,000; naphtha products, 1,148,000 pounds. The principal articles imported were: forest goods, to the value of 92,000 roubles; plants and the like, 410,000 pounds; different articles in wood, 94,000; unwrought leather, 116,000 pounds; wrought leather, 27,000; cotton, 1,161,000; cotton tissues, 45,000; wool, 17,000; cast-iron, 2,998,000; iron, 596,000; tin, 5,000; steel, 148,000; copper, 59,000; pewter, 54,000; lead, 724,000; zinc, 28,000; drugs, 4,091,000; coal and coke, 56,897,000 pounds. The principal manufactured articles imported were: earthenware and china, 5,000 pounds; glass, 33,000; farming implements, 7,000; cast-iron, 67,000; iron and steel, 133,000; machines and apparatus, 392,000; paper, 8,000; flax and hemp, 6,000; and wool, 4,000 pounds. The above mentioned data do not show the full turnover of the foreign trade in St. Petersburg; goods going by railway through the frontier are sent to the St. Petersburg inland customhouse to be examined; moreover, some of the goods, especially forest products, of the St. Petersburg port are sent to Cronstadt to be exported. The importance which St. Petersburg has for the trade of Finland will be mentioned in Section IV. Below are given data showing the turnover of the St. Petersburg inland customhouse.

*St. Petersburg Inland Customhouse:* The value of goods sent for inspection was consecutively, from 1886 to 1890, as follows: 11.4, 8.0, 9.4, 9.2, 9.7, or on the average, 9.5 million roubles, of which foodstuffs formed 30 per cent; raw and half-wrought materials, 31 per cent; and manufactured articles, 39 per cent. Foreign goods were principally transported to St. Petersburg for evaluating the duties through the following frontier customhouses: Virballen, 60 per cent; Odessa, 18; Reval, 13; Granitsa, 6; Radzivilov, 2; and Libau, 1 per cent. The principal foodstuffs imported were: vegetables and fruit, 23,000, and groceries, 45,000 pounds. Of the raw and half-wrought materials: cotton, 31,000 pounds; cotton tissues, 5,000; iron, 2,000; steel, 3,000; copper, 3,000; drugs, 25,000 pounds. Of the manufactured articles: glass goods, 3,000 pounds; iron and steel, 20,000; machines and apparatus, 40,000; paper, 4,000; woollen goods, 1,000; and cotton articles, 1,000 pounds.

*Reval and Baltic Ports:* The value of the import was from 1886 to 1890 consecutively: 53.9, 65.3, 43.7, 49.9, 54.4, or on the average 53.4 million roubles, of which foodstuffs formed 6 per cent; raw and half-wrought materials, 83 per cent; and manufactures, 11 per cent. The value of the export was during the same years as follows: 12.2, 25.7, 23.3, 18.7, 19.4 million roubles, or on the average 19.9 millions, of which foodstuffs formed 57 per cent; raw and half-wrought materials, 40 per cent; animals, 2 per cent; and manufactures, 1 per cent. The average import exceeded the export by 33,500,000 roubles; the export of foodstuffs was greater than the import by 8,200,000; of raw and half-wrought materials, on the contrary, the import exceeded the export by 36,300,000; the export of animals exceeded the import by 300,000; and of manufactures the import was greater than the export by 5,700,000 roubles.

The total weight of goods exported amounted, during the above years, to 15,600,000 pounds; and that of goods imported, to 8,900,000 pounds. The principal foodstuffs exported were: grain, 11,144,000 pounds; meat, 18,000; spirits, 1,260,000 pounds. The principal imports were: vegetables and fruit, 135,000 pounds; herrings and other fish, 317,000; groceries, 45,000; grape wine, 12,000 pounds. Of raw and half-wrought materials the principal articles of export were: lumber, to the value of

70,000 roubles; various seeds, 1,350,000 pounds; oil, 290,000; flax and tow, 1,140,000; hemp and tow, 62,000; different kinds of hair, 9,000; naphtha products, 123,000 pounds. The chief imports were: plants, 95,000 pounds; different kinds of lumber, 7,000; leather unwrought, 21,000; wrought leather, 13,000, cotton, 3,230,000; cotton tissues, 43,000; wool, 20,000; unwrought cast-iron, 151,000; iron, 162,000; steel, 68,000; copper, 13,000; pewter, 13,000; lead, 13,000; drugs, 370,000; and coal and coke, 3,348,000 pounds.

Of animals exported the principal were game, 667,000 pieces. Of manufactures imported the chief were: earthenware and china, 4,000 pounds; glass, 6,000; farming implements, 8,000; cast-iron, 11,000; iron and steel wares, 91,000; machines and apparatus, 250,000; paper, 3,000; flax and hemp, 8,000; woollen goods, 3,000 pounds, and cotton goods, 3,000 pounds.

*Riga Customhouse:* The value of the import for 1886 to 1890 inclusive, was successively as follows: 23,600,000; 20,700,000; 21,700,000; 20,800,000; 21,400,000 paper roubles, or on the average, 21,700,000 paper roubles; out of this number 16 per cent represented foodstuffs, 66 per cent raw and half-manufactured materials, and 18 per cent, finished wares. The value of the export for the same period amounted successively to 38,600,000; 52,300,000; 53,700,000; 51,200,000; 53,100,000 paper roubles, or on the average, to 49,800,000 paper roubles, distributed as follows: foodstuffs, 27 per cent; raw and half-manufactured materials, 73 per cent. The average value of the export exceeds that of the import by 28,100,000 paper roubles, this sum being distributed as follows: foodstuffs, 9,900,000, and raw and half-manufactured materials, 22,100,000 roubles paper; as to finished goods, their import exceeds the export by 3,900,000 roubles paper. The total weight of the goods exported for the years reviewed reached an average of 66,800,000 pounds; and that of goods imported, 20,700,000 pounds. Of the foodstuffs the principal articles of export were: grain, 16,892,000 pounds; meat, 7,000 pounds; and eggs, 63,000,000 pieces. The principal articles of import were, vegetables and fruit, 128,000 pounds; herrings and other fish, 659,000 pounds; colonial wares, 47,000 pounds; grape wine, 31,000 pounds; and mineral waters, 4,000 pounds. Of raw and half-manufactured materials the principal exports were: lumber, to the value of 11,302,000 paper roubles; various seeds, 4,413,000 pounds; seed residues, 1,462,000 pounds; flax and tow, 2,775,000 pounds; hemp and tow, 826,000 pounds; skins, 14,000 pounds; hides, 96,000 pounds; hair of all kinds, 24,000 pounds; wool unspun; 162,000 pounds; naphtha products, 344,000 pounds. The import of such materials was: lumber, to the value of 18,000 paper roubles; plants and the like, 353,000 pounds; wood of various kinds, 5,000 pounds; raw hides, 18,000 pounds; tanned leather, 7,000 pounds; cotton, 135 pounds; cotton yarn, 8,000 pounds; unwrought cast-iron, 1,412,000 pounds; iron, 440,000 pounds; steel, 216,000 pounds; lead, 26,000 pounds; drugs, 1,929,000 pounds; coal and coke, 10,352,000 pounds. Of the finished wares the principal imports were: faïence and porcelain, 2,000 pounds; glass, 3,000 pounds; agricultural implements, 48,000 pounds; wrought cast-iron, 8,000 pounds; iron and steel, 66,000 pounds; machinery and apparatus, 133,000 pounds; paper 3,000 pounds; flax and hemp goods, 2,000 pounds; and woolens, 3,000 pounds.

*Libau Customhouse:* The value of the import for 1886 to 1890 inclusive was successively as follows: 13,100,000; 11,300,000; 24,300,000; 30,000,000; 18,700,000 paper roubles, or on the average, 19,500,000 paper roubles, out of which 13 per cent

fell to foodstuffs, 73 per cent, to raw and half-manufactured materials, and 14 per cent to finished goods.

The value of the export for the given period was successively as follows: 25,300,000; 31,900,000; 51,000,000; 46,500,000; 38,300,000 roubles paper, or on the average, 38,600,000 roubles paper distributed in kind of wares as follows: foodstuffs, 63 per cent; raw and half-manufactured materials, 36 per cent; and animals, 1 per cent. The export exceeded the import, on the average, by 19,100,000 paper roubles; the export of foodstuffs exceeded the import thereof by 21,600,000 paper roubles; while the import of finished wares exceeded the export thereof by 2,500,000 paper roubles. The export value of the materials was on the average equal to that of the import. The average total weight of the goods exported during the given period reached 40,900,000 pounds, and that of the goods imported, only 9,200,000 pounds.

Of the foodstuffs exported the principal were: grain, 32,834,000 pounds; meat, 43,000 pounds; eggs, 25,000,000 pieces; and alcohol, 730,000 pounds. Of those imported the principal were: vegetables and fruit, 24,000 pounds; cheese, 4,000 pounds; herrings and other fish, 1,210,000 pounds; colonial wares, 40,000 pounds; grape wine, 11,000 pounds; and mineral waters, 20,000 pounds.

Of the raw and half-manufactured materials the principal exports were: lumber, to the value of 285,000 paper roubles; all kinds of seeds, 2,484,000 pounds; seed residues, 1,077,000 pounds; flax and tow, 788,000 pounds; hemp and tow, 114,000 pounds; various skins, 74,000 pounds; different hides, 61,000 pounds; all kinds of hair, 50,000 pounds; wool unspun, 206,000 pounds; naphtha products, 1,016,000 pounds. The principal imports of such materials were: plants and the like, 348,000 pounds; raw hides, 16,000 pounds; tanned leather, 9,000 pounds; cotton, 639,000 pounds; cotton yarn, 10,000 pounds; unwrought cast-iron, 383,000 pounds; all sorts of iron, 166,000 pounds; steel, 59,000 pounds; brass, 6,000 pounds; tin, 12,000 pounds; lead, 23,000 pounds; zinc, 7,000 pounds; drus, 876,000 pounds; coal and coke, 3,535,000 pounds; of animals the principal article of export was game, 261,000 pieces. Of the finished wares the principal imports were: farming implements, 38,000 pounds; wrought cast-iron, 12,000 pounds; iron and steel wares, 63,000 pounds; machinery and apparatus, 78,000 pounds; flax and hemp goods, 14,000 pounds.

*Odessa Customhouse:* The value of the import for 1886 to 1890 inclusive was successively as follows; 66,100,000; 39,600,000; 43,700,000; 45,900,000; 49,100,000 roubles paper, or on the average, 48,800,000 roubles paper, out of which 40 per cent fell to foodstuffs; 50 per cent, to raw and half-wrought materials; and 10 per cent, to finished wares.

The value of the export during the same period was successively as follows: 88,200,000; 122,900,000; 162,200,000; 159,400,000; 126,500,000 roubles paper, or on the average 131,800,000 roubles, distributed as follows: foodstuffs, 80 per cent; raw and half-manufactured materials, 11 per cent; animals, 2 per cent; and finished wares, 7 per cent. The export exceeded the import on the average by 83,000,000 roubles; the export exceeded the import of foodstuffs by 86,000,000 roubles; of animals by, 2,800,000 roubles paper; of finished wares, by 4,800,000 roubles; while the import of raw and half-manufactured materials exceeded the export by 10,600,000 roubles paper. The total weight of the goods exported during this period reached on the average 104,900,000 pounds, while that of the goods imported was 18,800,000 pounds.

Of foodstuffs the principal exports were: grain, 90,661,000 pounds; meat, 23,000 pounds; fish, 216,000; sugar, 3,098,000 pounds; cigarettes, 8,000,000 pieces; alcohol, 900,000 pounds; and the principal imports were: vegetables and fruit, 907,000 pounds; cheese, 5,000 pounds; herrings and other fish, 23,000 pounds; colonial wares, 466,000 pounds; grape wine, 21,000 pounds; mineral waters, 18,000 pounds.

Of raw and half-manufactured materials the following were chiefly exported: lumber, to the value of 1,050,000 roubles paper; different seeds, 2,971,000 pounds; seed residues, 393,000 pounds; hemp and tow, 12,000 pounds; unspun wool 382,000 pounds; naphtha products, 57,000 pounds; the principal imports of such materials were: lumber to the value of 26,000 paper roubles; plants and the like, 310,000 pounds; wood of various kinds, 7,000 pounds; hides untanned, 40,000 pounds; cotton, 1,423,000 pounds; cotton yarn, 18,000 pounds; unwrought cast-iron, 122,000 pounds; iron, 670,000 pounds; steel, 54,000 pounds; tin, 14,000 pounds; lead, 144,000 pounds; drugs, 1,206,000 pounds; coal and coke, 10,208,000 pounds. Of the animals exported the principal were fowls, 224,000 pieces. The principal finished wares imported were: porcelain and faïence, 9,000 pounds; glass 25,000 pounds; agricultural implements, 61,000 pounds; wrought cast-iron, 36,000 pounds; iron and steel wares, 124,000 pounds; machinery and apparatus, 92,000 pounds; paper wares, 10,000 pounds; and flax and hemp goods, 138,000 pounds.

*Moscow Customhouse:* The value of the goods brought for examination to the customhouse from 1886 to 1890 inclusive was successively as follows: 66,700,000; 48,800,000; 58,200,000; 67,900,000; 56,900,000 roubles paper; or on the average, 57,700,000 roubles, distributed as follows: foodstuffs, 33 per cent; raw and half-manufactured materials, 50 per cent; and finished wares, 17 per cent.

The import was chiefly through the frontier customhouses; 29 per cent of the total value of import fell to Graevo; 19 per cent, to Odessa; 17 per cent, to Virballen; 15 per cent, to Alexandrovo; 8 per cent, to St. Petersburg; 4 per cent, to Reval; 3 per cent, to Granitsa; 2 per cent, to Radzivilov; to Libau, Sosnovitsi and Riga, 1 per cent each.

Of the foodstuffs the principal imported were: vegetables and fruit, 7,000 pounds; cheese, 12,000 pounds; colonial wares, 688,000 pounds, among them, 673,000 pounds of tea: grape wine, 88,000 pounds. Of raw and half-manufactured materials the principal imports were: hides untanned, 3,000 pounds; tanned leather, 25,000 pounds; pelts, 9,000 pounds; cotton, 24,000 pounds; cotton yarn, 88,000 pounds; silk, 19,000 pounds; wool, 95,000 pounds; iron, 88,000 pounds; steel, 15,000 pounds; brass, 18,000 pounds; drugs, 147,000 pounds. The principal imported finished wares were: faïence and porcelain, 4,000 pounds; glass, 8,000 pounds; agricultural implements, 7,000 pounds; wrought cast-iron, 10,000 pounds; iron and steel wares, 103,000 pounds; machinery and apparatus, 137,000 pounds; paper wares, 9,000 pounds; flax and hemp goods, 10,000 pounds; woollen goods, 8,000 pounds; and cotton goods, 5,000 pounds.

*Warsaw Customhouse:* The value of the goods brought for examination from 1886 to 1890 inclusive was successively as follows: 12,000,000; 10,900,000; 18,600,000; 22,300,000; 19,800,000 paper roubles, or on the average, 16,700,000 paper roubles, out of which 18 per cent fell to foodstuffs; 46 per cent to raw and half-wrought materials; and 36 per cent, to finished goods. The imports to Warsaw were chiefly through the following frontier customhouses: Alexandrovo, 53 per cent of the total import value; Mlava, 17 per cent; Odessa, 13 per cent; Granitsa, 9 per cent; Sosnovitsa, 6 per cent; and through all others, 2 per cent.

The principal foodstuffs imported were: vegetables and fruit, 96,000 pounds; herrings and other fish, 147,000 pounds; colonial wares, 55,000 pounds; grape wine, 45,000 pounds; mineral waters, 12,000 pounds. Of the raw and half-manufactured materials the principal imports were: plants and seeds, 27,000 pounds; all kinds of wood, 12,000 pounds; hides untanned, 74,000 pounds; tanned leather 8,000 pounds; cotton, 270,000 pounds; cotton yarn, 36,000 pounds; wool, 7,000 pounds; unwrought cast-iron, 38,000 pounds; iron, 67,000 pounds; steel, 88,000 pounds; drugs, 175,000 pounds. Of the finished wares the principal imports were: faience and porcelain, 6,000 pounds; agricultural implements, 29,000 pounds; wrought cast-iron, 15,000 pounds; iron and steel, 143,000 pounds; machinery and apparatus, 50,000 pounds; paper, 5,000 pounds; flax and hemp goods, 6,000 pounds; and cotton goods, 5,000 pounds.

#### DISTRIBUTION OF GOODS BY COUNTRIES.

The distribution of goods by the separate foreign countries, according to the import and export, and the computation of the turnover with regard to different countries, are two problems not easily solved with the present unsatisfactory state of the international statistics. In despatching goods the shipper is not always able to declare their point of destination, as after the lading, and even in transit to a given point, the goods may be ordered to another destination without the knowledge of the despatch customhouse, as is often the case, when they are resold by large agencies.

With regard to the denomination of the country whence the goods come, the fact must be remembered that the wares sent to Russia are often accompanied by documents, written when the goods were already on their way, and given out on relading or repacking, as in cases of transshipment due to the lack of direct means of communication, et cetera; thus, valuable wares coming from Switzerland and France are most often necessarily reckoned as coming from Germany, as they are brought in collected lots by German forwarding agents. Regardless of the direct profit the latter derive from the cost of the transport, and the reducing of the so-called waybill expenses, this method of depriving the goods of their individuality answers to the interests of the receivers, who generally try their utmost to keep secret the place whence their goods are imported.

Besides these cases of absolutely false data, the statistics of the international trade have to reckon with the notable fact of the existence of special centres for the principal goods, whither they are brought from the places of their production, and whence, after their sorting, classification, et cetera, they are sent to the places of their consumption; thus, the wares are not coming by the shortest way from the places of their production to those of their consumption, but, according to their different kinds, are subject to the law of gravitation towards definite centres. The further development of the international trade tends to decentralization, dependent upon the acquirement of a more thorough knowledge of the technical side of the trade by the producers, as well as by the consumers; only few goods, however, have attained this stage; for most of the articles of the large international trade the tending towards the centralization of goods and bargains in large trade centres is still very considerable.

It results, therefore, that in order to obtain an exact knowledge of the direction and the amount of trade returns, it would be necessary to investigate each separate article over the whole world; or, that all the principal countries should agree to take measures for the registration, according to a special program, of the most important data referring to the international trade in general, or at least to that of the principal articles.

With regard to the distribution of the import and export across the European frontier to different countries, it is necessary to bear in mind that, when the export through the southern ports is shown, as ships of the Union Jack predominate, Great Britain is chiefly marked as the point of destination, although the discharging is done in the ports of the Mediterranean Sea, of the Atlantic Ocean, and even of the North Sea as well; besides, it happens that the goods are marked as if exported to Turkey, while in reality they are only transhipped in Constantinople; the same is true with regard to wares marked in the reports of the Baltic ports as exported to Denmark, while they are only transhipped there.

Relative to the export by land, the Russian statistics are not able to state what part of the goods is destined for an uninterrupted transit through the neighbouring countries, and more especially to state what part is to be transit goods after passing through the depots. On the other hand, the data of the import exaggerate the share of the neighbouring countries at the expense of those more distant. Although the existing figures do not state very exactly which foreign countries are engaged in the import of their wares to Russia, and to which Russia exports its goods, nevertheless they present a material which can be of some use in showing the dimensions of the trade relations, including herein all kinds of commission business, transport agencies, et cetera.

It can be seen from the above that the data referring to the trade between two countries as given in their returns are not expected always to correspond. On the average, the value of the import across the European frontier for the period 1886 to 1890 is distributed among separate foreign countries as follows: From Germany, 34.1 per cent; from Great Britain, 26.8 per cent; from the United States of America, 10.9 per cent; from Austro-Hungaria, 4.4 per cent; from France, 4.1 per cent; from Turkey, 2.3 per cent; from Italy, 2.1 per cent; from Belgium, 2 per cent; from the Netherlands, 1.2 per cent; and from other countries, 12.1 per cent. Correspondingly, the export is as follows: To Great Britain, 34.7 per cent; to Germany, 27 per cent; to the Netherlands, 7.3 per cent; to France 6.3 per cent; to Italy, 4.6 per cent; to Austro-Hungaria, 4.1 per cent; to Belgium, 3.9 per cent; to Turkey, 2.2 per cent; to Sweden, 1.7 per cent; to Denmark, 1.5 per cent; to Greece, 1.3 per cent; and to other countries, 5.4 per cent.

Out of the total value of the turnover, import as well as export, reaching an average of 963,000,000 roubles paper during the period from 1886 to 1890, 31.7 per cent fell to the trade with Great Britain; 29.6 per cent, to Germany; 5.5 per cent, to France; 5 per cent, to the Netherlands; 4.3 per cent, to Austro-Hungary; 4.1 per cent, to the United States of America; 3.6 per cent, to Italy; 3.2 per cent, to Belgium; 2.2 per cent, to Turkey; 1.3 per cent, to Sweden; 1.2 per cent, to Denmark; 1 per cent, to Greece; 0.8 per cent, to Norway; 0.7 per cent, to Roumania; 0.7 per cent, to Spain; 0.2 per cent, to Portugal; and 4.9 per cent, to other countries.



In the same order, data referring to separate countries are given below, to characterize the trade relations of Russia with such countries.

*Great Britain:* The value of the import for the period 1886 to 1890 inclusive was successively as follows: 108,000,000; 91,600,000; 96,000,000; 95,900,000; 86,700,000 roubles paper, or on the average 95,600,000 roubles; out of which 14 per cent fell to foodstuffs; 67 per cent to raw and half-wrought materials; and 19 per cent to finished wares. The value of the export for the same period was successively as follows: 139,900,000; 182,300,000; 287,700,000; 257,600,000; 191,900,000 roubles paper, or on the average 210,000,000 roubles; out of which 67 per cent fell to foodstuffs, and 33 per cent to raw and half-wrought materials.

The export exceeded the import on the average by 114,500,000 paper roubles. With regard to the kind of wares, the difference between the figures of import and of export averaged as follows: the export of foodstuffs exceeded the import by 126,500,000 roubles paper; that of raw and half-wrought materials exceeded the import by 4,500,000 roubles paper; while the import of finished wares exceeded their export by 17,100,000 roubles paper.

Of the foodstuffs the principal exports were: grain 588,056,000 pounds; sugar, 1,739,000 pounds; alcohol, 81,000 pounds; eggs, 73,000,000 pieces; all kinds of meat, 39,000,000 pounds. Of those imported the principal were: fish, and especially herrings, 1,792,000 pounds; colonial wares, 470,000 pounds, including 241,000 pounds of tea, and 141,000 pounds of coffee.

The principal raw and half-wrought materials exported were: lumber, to the value of 15,948,000 paper roubles; linseed, hempseed, rape seed, and other seeds, 12,645,000 pounds; seed residues, 1,728,000 pounds; flax, combed flax, and tow, 4,086,000 pounds; wool unspun, 1,158,000 pounds; hemp and hemp tow, 703,000 pounds; pelts 655,000 pounds; flax and hemp yarn, 108,000 pounds; naphtha and its products, 384,000 pounds; different kinds of hair, 69,000 pounds; different hides, 54,000 pounds. The principal raw and half-wrought materials imported were: coal and coke, 89,757,000 pounds; cast-iron, 5,439,000 pounds; drug wares, 3,227,000 pounds; cotton, 1,673,000 pounds; iron, 852,000 pounds; plants and the like, 629,000 pounds; lead, 550,000 pounds; steel, 202,000 pounds; cotton yarn, 154,000 pounds; tin, 73,000 pounds; brass, 62,000 pounds; hides untanned, and tanned leather, 60,000 pounds; and wool, 58,000 pounds. The principal animals exported were: live fowls and slaughtered game, 798,000 pieces. The principal finished goods imported were: machinery and apparatus, 865,000 pounds; iron and steel wares, 410,000 pound; flax and hemp goods, 159,000 pounds; articles of husbandry, 128,000 pounds; and wrought cast-iron, 115,000 pounds.

*Germany:* The value of the import from 1886 to 1890 inclusive reached successively: 135,200,000; 112,500,000; 122,300,000; 124,100,000; 114,300,000 roubles paper, or on the average 121,700,000 roubles; out of this figure, 11 per cent fell to foodstuffs, 61 per cent to raw and half-wrought materials, and 28 per cent to finished goods. The value of the export for the same period was successively as follows: 118,600,000; 151,700,000; 181,600,000; 190,400,000; 176,500,000 roubles paper, or on the average 163,700,000 roubles, out of which, foodstuffs furnished, 37 per cent; raw and half-wrought materials, 56 per cent; animals, 4 per cent; and finished wares, 3 per cent.

The total export exceeded the import by 42,000,000 roubles paper; on the aver-

age, the difference between the figures according to the various goods averaging as follows: the export exceeded the import of foodstuffs by 46,500,000 roubles paper; that of raw and half-wrought materials by 18,300,000 roubles paper; of animals by 6,700,000 roubles paper; on the contrary the import of finished goods exceeded their export by 29,500,000 roubles paper.

The principal foodstuffs exported were: grain, 58,381,000 pounds; alcohol and corn brandy, 2,616,000 pounds; potatoes, 1,365,000 pounds; sugar, 378,000 pounds; eggs, 235,035,000 pieces; and cigarettes, 12,625,000 pounds. The principal foodstuffs imported were: herrings and other fish, 996,000 pounds; vegetables and fruits, 386,000 pounds; salt, 509,000 pounds; colonial wares, 345,000 pounds; grain supplies, 248,000 pounds, including 83,000 pounds of rice; grape wine, 108,000 pounds; mineral waters, 70,000 pounds; and cheese, 28,000 pounds.

The principal raw and half-wrought materials exported were: lumber, to the value of 15,508,000 paper roubles; seeds, 4,774,000 pounds; flax, 4,366,000 pounds; hemp, 2,523,000 pounds; seed residues, 2,446,000 pounds; naphtha products, 1,829,000 pounds; hides, 249,000 pounds; wool unspun, 222,000 pounds; skins, 197,000 pounds; bristles, 113,000 pounds; feathers, 59,000 pounds. The same materials imported were: coal and coke, 16,900,000 pounds; drug wares, 2,693,000 pounds; cast-iron, 2,015,000 pounds; iron, 1,797,000 pounds; cotton, 1,140,000 pounds; plants and the like, 695,000 pounds; lead, 450,000 pounds; wool, 361,000 pounds; steel, 312,000 pounds; hides untanned, 226,000 pounds; zinc, 146,000 pounds; all kinds of wood, 91,000 pounds; cotton yarn, 71,000 pounds; brass, 63,000 pounds; tanned leather, 58,000 pounds; silk, 20,000 pounds; pelts, 18,000 pounds; and tin, 14,000 pounds. The principal animals exported were: domestic fowls, 2,588,000 pieces; game, 956,000 pieces; and horses, 25,000 head.

The principal finished wares imported were: machinery and apparatus, 657,000 pounds; iron and steel goods, 286,000 pounds; implements of husbandry, 206,000 pounds; wrought cast-iron, 78,000 pounds; paper wares, 63,000 pounds; glass goods, 36,000 pounds; flaxen and hempen articles, 29,000 pounds; woollen, 27,000 pounds; cotton goods, 21,000 pounds; porcelain and faïence, 15,000 pounds; perfumery and cosmetics, 7,000 pounds; and silken stuffs, 2,000 pounds.

*France:* The value of the import from 1886 to 1890 inclusive reached successively: 11,500,000; 13,200,000; 13,200,000; 18,400,000; 16,200,000 roubles paper, or on the average, 14,500,000 roubles, distributed as follows: for foodstuffs, 29 per cent; for raw and half-wrought materials, 46 per cent; for finished wares, 25 per cent. The value of the export for the same period equalled successively: 24,600,000; 35,900,000; 52,800,000; 35,200,000; 41,800,000 roubles paper, or on the average 38,100,000 paper roubles, out of which 66 per cent fell to foodstuffs; 33 per cent to raw and half-wrought materials; and one per cent to animals.

The total export exceeds the total import on the average by 23,600,000 roubles paper, the difference in the figures with regard to the kinds of goods averaging as follows: the export exceeded the import of foodstuffs by 21,100,000 roubles paper; that of raw and half-wrought materials, by 5,700,000 roubles paper; of animals, by 200,000 roubles; on the contrary the import of finished goods exceeded the export thereof by 3,500,000 roubles. The principal foodstuffs exported were: grain, 27,017,000 pounds; and alcohol, 322,000 pounds; those imported:

grape wine, 140,000 pouds; herrings and other fish, 32,000 pouds; vegetables and fruit, 22,000 pouds; colonial wares, 12,000 pouds; mineral waters, 8,000 pouds; and cheese, 3,000 pouds.

The principal raw and half-wrought materials exported were: flax and flax tow, 1,480,000 pouds; different kinds of seeds, 1,099,000 pouds; seed residues, 266,000 pouds; wool unspun, 149,000 pouds; hemp and hemp tow, 79,000 pouds; naphtha and its products, 61,000 pouds; pelts, 14,000 pouds; hides, 12,000 pouds; lumber to the value of 2,402,000 roubles. The principal of such materials imported were: drug and chemical products 740,000 pouds; cotton, 88,000 pouds; lead, 86,000 pouds; hides not tanned, 15,000 pouds; plants and the like, 13,000 pouds; wool, 11,000 pouds; silk, 6,000 pouds; lumber, to the value of 24,000 roubles. The principal animals exported were: live domestic fowls, 93,000 pieces. Of the finished goods the principal imported were: machinery and apparatus, 18,000 pouds; iron and steel wares, 18,000 pouds; faïence and porcelain goods, 7,000 pouds; flaxen and hempen wares, 6,000 pouds; glass wares, 4,000 pouds; paper goods 4,000 pouds; woollen goods, 2,000 pouds; cosmetics and perfumery, 2,000 pouds.

*Netherlands:* The value of the import reached in the period from 1886 to 1890 inclusive successively: 4,000,000; 3,700,000; 4,600,000; 4,400,000; 4,900,000 roubles, or on the average 4,300,000 roubles paper, distributed as follows: foodstuffs, 28 per cent; raw and half-wrought materials, 64 per cent; finished goods, 8 per cent. The value of the export for the same period equalled successively: 36,300,000; 45,900,000; 52,900,000; 45,500,000; 40,000,000 roubles paper, or an average of 44,100,000 roubles, of which 80 per cent fell to foodstuffs, and 20 per cent to raw and half-wrought materials.

The total export exceed the total import on the average by 39,800,000 roubles; according to the class of wares, the difference between the figures of export and import averaged as follows: the export exceeded the import of foodstuffs by 33,800,000 roubles; that of the raw and half-wrought materials, by 6,300,000 roubles; on the contrary, the import of finished goods exceeded the export thereof by 300,000 roubles. The principal foodstuffs exported were: grain, 42,732,000 pouds; eggs, 3,755,000 pieces; and cigarettes, 1,114,000 pieces; those imported: fish and herrings, 131,000 pouds; and colonial wares, 21,000 pouds.

The principal raw and half-wrought materials exported were: lumber, to the value of 2,335,000 paper roubles; seeds, 3,729,000 pouds; naphtha and its products, 392,000 pouds; flax, combed flax and tow, 145,000 pouds; hemp, 55,000 pouds; seed residues, 41,000 pouds; the principal raw and half-wrought materials imported were: cast iron, 281,000 pouds; drug wares, 174,000 pouds; iron, 162,000 pouds; steel, 51,000 pouds; plants and the like, 40,000 pouds; tin, 24,000 pouds; and lead, 22,000 pouds. Of the finished goods the principal imported were iron and steel wares, 12,000 pouds.

*Austro-Hungary:* The value of the import for 1886 to 1890 inclusive reached successively: 16,600,000; 12,400,000; 14,600,000; 18,400,000; 17,300,000 roubles, or an average of 15,900,000 roubles distributed, as follows: foodstuffs, 13 per cent; raw and half-wrought materials, 49 per cent; animals, one per cent; finished wares, 37 per cent. The export value for the same period was successively as follows: 23,900,000; 24,000,000; 23,500,000; 27,600,000; 26,900,000 roubles paper, or 25,200,000

roubles on the average, out of which 55 per cent fell to foodstuffs, 37 per cent to raw and half-wrought materials; 5 per cent to animals; and 3 per cent to finished goods.

The total export exceeded the total import on the average by 9,300,000 roubles; and in the former foodstuffs and raw and half-wrought materials predominate, while in the latter finished goods are of first importance. According to the class of wares the difference between the figures of export and import averages as follows: the export exceeds the import of foodstuffs by 11,600,000 roubles; that of the raw and half-wrought materials, by 1,600,000 roubles; of animals, by 1,200,000 roubles; the import of finished goods exceeds, on the contrary, the export there by 5,100,000 roubles.

The principal foodstuffs exported were: grain, 9,670,000 pounds; potatoes, 405,000 pounds; eggs, 254,000,000 pieces; sugar, 82,000 pounds; tobacco, 70,000 pounds; and cigarettes, 1,000,000 pieces; those imported: kitchen salt, 148,000 pounds; vegetables and fruit, 72,000 pounds; colonial wares, 20,000 pounds; grape wine, 50,000 pounds; and mineral waters, 37,000 pounds.

The principal raw and half-wrought materials exported were; lumber, to the value of 480,000 roubles; seeds, 434,000 pounds; seed residues, 20,000 pounds; flax and combed flax, 218,000 pounds; hemp and tow, 101,000 pounds; skins, 12,000 pounds; pelts, 62,000 pounds; manes and horse tails, 24,000 pounds; bristles, 16,000 pounds; down and feathers, 39,000 pounds; wool unspun, 191,000 pounds; and naphtha products, 1,292,000 pounds. The same materials imported were: plants and the like, 140,000 pounds; cast-iron, 220,000 pounds; iron, 105,000 pounds; drugs, 290,000 pounds; coal and coke, 2,263,000 pounds; ozocerite, 126,000 pounds; ceresin, 12,000 pounds; and lumber, to the value of 2,330,000 roubles paper. The principal animals exported were: live fowls, 215,000 pieces; rams and sheep, 85,000 head; and horses, 3,000 head. Of finished goods the principal imported were: glass wares, 30,000 pounds; agricultural implements, 65,000 pounds; iron, steel and cast-iron wares, 161,000 pounds; machinery and apparatus, 188,000 pounds; and paper goods, 22,000 pounds.

*United States of America:* The value of the import reached for the period of from 1886 to 1890 inclusive successively: 26,800,000; 41,900,000; 20,800,000; 50,700,000; 53,400,000 roubles paper, or an average of 38,700,000 roubles, distributed as follows: raw and half-manufactured materials, 99 per cent; finished goods, one per cent. The export value for the same period was successively as follows: 300,000; 0; 0; 1,200,000; 400,000 paper roubles; or on the average 400,000 paper roubles, out of which 54 per cent fell to foodstuffs; 44 per cent to half-manufactured materials; and one per cent to animals and finished goods.

The total import exceeded the total export on the average by 38,700,000 roubles, the difference between the import and export figures averaging as follows: the import exceeded the export of raw and half-manufactured materials by 38,200,000 roubles; of finished wares, by 200,000 roubles; while the export of foodstuffs exceeds the import thereof by 100,000 roubles. Of the foodstuffs wheat was chiefly exported, 104,000 pounds.

The principal exports of raw and half-manufactured materials were: wool unspun, 16,000 pounds; the principal imports thereof: cotton, 3,664,000 pounds; white resin, 901,000 pounds; dye wood, 606,000 pounds; leather untanned, 93,000 pounds;

plants and the like, 50,000 pounds; jute, 40,000 pounds; and lead, 5,000 pounds. Of the finished goods implements of husbandry were chiefly imported, 30,000 pounds.

*Turkey*: The import value from 1886 to 1890 inclusive was successively as follows: 16,100,000; 5,900,000; 4,800,000; 6,600,000; 7,100,000 roubles paper, or on the average 8,100,000 roubles; out of this 68 per cent fell to foodstuffs, 27 per cent to raw and half-manufactured materials; and 5 per cent to finished goods. The export value for the same period equalled successively: 11,300,000; 15,400,000; 17,400,000; 12,500,000; 10,600,000 roubles paper, or an average of 13,400,000 roubles, distributed as follows: foodstuffs, 67 per cent; raw and half-manufactured goods, 13 per cent; animals, 10 per cent; and finished wares, 10 per cent. The average value of the total export exceeded that of the import by 5,300,000 roubles paper; the average difference between the figures of import and export with regard to the class of wares being: the export exceeds the import of foodstuffs by 3,500,000 roubles; that of animals, by 1,300,000 by roubles; of finished goods, by 1,000,000 roubles; while the import of raw and half-manufactured goods exceeds their export by 400,000 roubles.

Of the foodstuffs the principal exports were: grain, 4,033,000 pounds; alcohol, 2,696,000 pounds; butter, 135,000 pounds; sugar, 124,000 pounds; all kinds of caviar, 116,000 pounds; fish, 28,000 pounds; the principal imports: vegetables and fruit, 1,132,000 pounds; colonial wares, 90,000 pounds, including 70,000 pounds of tobacco; breadstuffs, 15,000 pounds; and wine, 14,000 pounds.

Of the raw and half-manufactured materials the principal exports were: lumber, to the value of 571,000 roubles paper; tallow, 126,000 pounds; hides, 26,000 pounds; and wool unspun, 10,000 pounds; and the principal imports: drugs, 156,000 pounds; including 123,000 pounds olive oil; plants and the like, 78,000 pounds; cotton, 32,000 pounds; raw hides, 7,000 pounds; and lumber, to the value of 50,000 roubles. The principal animals exported were: rams and sheep, 59,000 head; oxen and cows, 12,000 head. Of the finished wares the principal imports were: iron and steel goods, 3,000 pounds.

*Sweden*: The value of the import for 1886 to 1890 inclusive was successively as follows: 2,400,000; 1,200,000; 2,400,000; 2,700,000; 3,900,000 roubles, or on the average 2,500,000 roubles; out of this number 31 per cent fell to foodstuffs; 37 per cent, to raw and half-manufactured goods; and 32 per cent, to finished wares. The export value for the same period equalled successively: 9,800,000; 11,100,000; 11,100,000; 9,100,000; 10,200,000 roubles, or an average of 10,300,000 roubles, distributed as follows; foodstuffs, 83 per cent; raw and half-manufactured materials, 16 per cent; finished goods, one per cent.

The average export exceeded the import by 7,800,000 roubles, the difference of the figures with regard to various classes of wares averaging as follows: the export exceeded the import for foodstuffs by 7,700,000, for raw and half-manufactured goods by 800,000 roubles; while the import of finished goods exceeded the export thereof by 700,000 paper roubles.

The principal foodstuffs exported were: grain, 9,550,000 pounds; and alcohol, 3,787,000 pounds; those imported: herring and other fish, 553,000 pounds; and breadstuffs, 13,000 pounds. Of raw and half-manufactured goods the principal exports were: lumber, to the value of 176,000 roubles; seed residues, 342,000 pounds; various seeds,

330,000 pounds; naphtha and its products, 291,000 pounds; flax and flax tow, 39,000 pounds; hemp and hemp tow, 39,000 pounds; the principal imports were: coal and coke, 251,000 pounds; cast-iron, 208,000 pounds; iron, 152,000 pounds; dye clays, 141,000 pounds; and steel, 15,000 pounds. The principal finished goods imported were: carpenters and coopers wares, 33,000 pounds; machinery and apparatus, 4,000 pounds; and iron and steel wares, wrought cast-iron, and farming implements, 3,000 pounds each.

*Denmark:* The value of the import for 1886 to 1890 inclusive reached successively: 1,200,000; 3,800,000; 2,100,000; 1,500,000; 1,600,000 roubles, or an average of 2,000,000 paper roubles; out of this number 20 per cent fell to foodstuffs; 66 per cent, to raw and half-manufactured goods; and 14 per cent, to finished wares. The export value for the same period was successively: 5,300,000; 7,700,000; 12,300,000; 11,600,000; 8,300,000 roubles, or on the average, 9,000,000 roubles, distributed as follows: foodstuffs, 63 per cent; raw and half-manufactured goods, 36 per cent; finished wares, one per cent.

The average total export exceeded the import by 7,000,000 roubles paper; with regard to the class of wares the difference in the figures averaged as follows: the export exceeded the import for foodstuffs, by 5,300,000; and for raw and half-manufactured goods, by 1,900,000 roubles; while the import of finished goods exceeded the export thereof by 200,000 roubles. The principal foodstuffs exported were: grain, 7,817,000 pounds; and lumber, to the value of 81,000 roubles; those imported: herrings and other fish, 47,000 pounds; vegetables and fruit, 10,000 pounds; wine, 9,000 pounds; and breadstuffs, 3,000 pounds.

Of the raw and half-manufactured goods the principal exports were: seed residues, 1,612,000 pounds; various seeds, 730,000 pounds; naphtha and its products, 390,000 pounds; flax and flax tow, 89,000 pounds; hemp and hemp tow, 48,000 pounds; the principal imports thereof were: drugs 161,000 pounds; cotton, 73,000 pounds; cast iron 33,000 pounds; raw hides, 4,000 pounds; and iron, 8,000 pounds. Of the finished goods the principal imports were: machinery and apparatus, 4,000 pounds; and steel and iron wares, 2,000 pounds.

*Greece:* The value of the import for 1886 to 1890 inclusive reached successively: 800,000; 800,000; 700,000; 1,200,000; 700,000 paper roubles, or an average of 800,000 paper roubles distributed as follows: foodstuffs, 42 per cent; raw and half-manufactured materials, 56 per cent; finished goods, 2 per cent.

The export value for the same period was successively as follows: 8,000,000; 9,800,000; 8,800,000; 6,800,000; 8,200,000 roubles, or on the average, 8,300,000 roubles; out of this number 88 per cent fell to foodstuffs; one per cent, to raw and half-manufactured goods; 9 per cent to animals; and 2 per cent, to finished wares.

The difference between the figures of the import and export, the latter exceeding the former on the average by 7,500,000 roubles, according to the various class of wares ran, as follows: the export exceeded the imports for foodstuffs, by 7,000,000; for animals, by 700,000; and for finished goods, by 100,000 roubles; while the import of raw and half-manufactured materials exceeded the export thereof by 400,000 roubles. Of the foodstuffs the principal exports were: grain, 7,794,000 pounds; all kinds of caviar, 31,000 pounds; and the principal imports: fruit, 101,000 pounds; and wine, 52,000 pounds. Of the raw and half-manufactured goods, lumber to the va-

lue of 54,000 roubles, was the principal export; the principal imports being: olive oil, 66,000 pounds, and wood bark, 40,000 pounds. The principal animals exported were; rams and sheep, 32,000 head; and oxen and cows, 7,000 head.

*Norway:* The value of the import for 1886 to 1890 inclusive, was successively as follows: 3,300,000; 4,300,000; 2,300,000; 3,400,000; 2,600,000 roubles; out of which number 96 per cent fell to foodstuffs; to raw and half-manufactured goods, and finished wares, 2 per cent each.

The export value for the same period was successively as follows: 4,800,000; 4,600,000; 5,600,000; 4,000,000; 2,300,000 roubles, or on the average 4,300,000 roubles paper, distributed as follows: foodstuffs, 89 per cent; raw and half-manufactured goods, 11 per cent.

The total export exceeded the import on the average by 1,100,000 roubles, the difference in the figures according to the class of wares being: the export exceeded the import on the average by 800,000 roubles, for foodstuffs; by 400,000 paper roubles, for raw and half-manufactured materials; on the contrary, for finished goods the import exceeded the export by 40,000 roubles. Of the foodstuffs the principal exports were: grain, 5,458,000 pounds; meat, 5,000 pounds; the principal imports: herrings and other fish, 2,643,000 pounds.

Of the raw and half-wrought goods the principal exports were: lumber to the value of 48,000 roubles; naphtha products, 84,000 pounds; various seeds, 55,000 pounds; hemp, 50,000 pounds; seed residues, 17,000 pounds; and the principal imports: spermaceti and train oil, 8,000 pounds, and dye clays, 3,000 pounds. The principally imported finished goods were carpenter and cooper wares, 3,000 pounds.

## EXTERNAL TRADE OF ASIATIC RUSSIA.

*The Caucasian coast of the Black Sea:* The value of the goods imported across the Black Sea frontier to the Caucasus amounted for 1886 to 1890 successively to: 4,100,000; 5,300,000; 7,400,000; 7,700,000; and 9,500,000 roubles. or on the average to 6,800,000 roubles; out of which number 5 per cent fell to foodstuffs; 72 per cent to materials; and 23 per cent to finished goods.

The growth of the import relates mainly to raw and half-manufactured materials, tin being first among them, as it is greatly needed in the manufacture of tin cases for the export of kerosene. No import duty is levied upon tin if it is to be returned abroad. The value of tin exported in the shape of cases, for 1886 to 1890 inclusively, amounted successively to: 500,000; 1,100,000; 2,400,000; 3,000,000; 4,100,000 roubles, or on the average to 2,200,000 roubles paper. If these data be excluded from the former, an average of 4,600,000 roubles will show the net value of the import during this period.

The value of the export across the same frontier for 1886 to 1890 inclusive may be fixed successively at: 22,600,000; 23,600,000; 31,200,000; 47,400,000; and 59,900,000 roubles, or at an average of 36,900,000 roubles, distributed as follows: foodstuffs, 36 per cent; materials, 61 per cent; finished goods, 3 per cent. Both the import and export of animals were inconsiderable. In 1891 the import value was

9,600,000, and the export reached 56,800,000 paper roubles, thus differing but little from the figures of 1890.

Excluding tin, which was returned abroad, the export exceeded the import on the average by 32,300,000 roubles. this sum being distributed as follows: the export of foodstuffs, by 12,800,000; of raw and half-manufactured goods, by 20,000,000 roubles; the import of finished goods, on the contrary, exceeded the export there of by 500,000 roubles. The same is true with regard to the data of 1891. The principal articles of the import, tin excluded, were: of the foodstuffs, vegetables and fruit in an average quantity of 43,000 pounds; and colonial wares, 6,000 pounds; during the same period 16,400,000 pounds of grain were exported, on the average.

Of the raw and half-manufactured materials the principal imports were: lumber, to the value of 285,000 roubles; cast-iron, 25,000 pounds; iron, 213,000 pounds; steel, 25,000 pounds; tin, 17,000 pounds; lead, 30,000 pounds; drugs, 395,000 pounds; coal and coke, 280,000 pounds: the principal exports were: naphtha and its products, 26,300,000 pounds; manganese ore, 4,300,000 pounds; linseed, 1,500,000 pounds; raw silk, 21,000 pounds; and wool unspun, 194,000 pounds. Liquorice was exported as follows; in 1889, 191,000 pounds; in 1890, 345,000 pounds; and in 1891, 838,000 pounds. Out of the total amount of the turnover of the Caucasian-Black Sea coast during 1886 to 1890, namely of 43,700,000 roubles, 64 per cent fall to the trade carried on in Batoum; 21 per cent to that of Novorossisk; and not over 15 per cent to the other points of the seacoast.

For *Batoum* the value of the import for 1886 to 1890 inclusive amounted successively to: 4,000,000; 5,100,000; 7,100,000; 7,500,000; 9,400,000 roubles, or to an average of 6,600,000 roubles, out of which 5 per cent fell to foodstuffs; 73 per cent to raw and half-wrought materials; and 22 per cent to finished goods. The export value reached for the same period successively: 14,400,000; 15,800,000; 23,300,000; 25,300,000; 27,300,000 roubles, or an average of 21,200,000 roubles distributed as follows: foodstuffs 8 per cent; materials, 87 per cent; finished goods, 5 per cent.

The average export exceeded the import by 14,600,000 roubles; the export of foodstuffs exceeding the import thereof by 1,300,000 roubles paper; that of materials, by 13,600,000 roubles; while the import of finished goods exceeds the export by 300,000 roubles. In 1891 the export value exceeded the import by 20,500,000 roubles.

The total weight of the exported goods for the given period reached successively: 14,600,000; 17,800,000; 30,300,000; 39,600,000; and 44,500,000, or on the average 29,400,000 pounds. The total weight of the imported goods was successively as follows: 1,300,000; 2,100,000; 3,500,000; 4,100,000; 4,900,000, or on the average 3,200,000 pounds. In this number the following successive import of tin is included: 100,000; 400,000; 900,000; 1,100,000; 1,500,000 pounds. In 1891 the total weight of the exported goods reached 50,000,000 pounds; and that of the imports 6,200,000 pounds.

During the period of 1886 to 1890 the principal exported foodstuffs were: grain, 1,360,000 pounds; and kitchen salt, 206,000 pounds; the principal imports thereof were: vegetables and fruit, 38,000 pounds; herring and other fish, 2,000 pounds; colonial goods, 6,000 pounds; grape wine, 2,000 pounds; and mineral waters, 1,000 pounds.



Of the raw and half-manufactured materials the principal exports were: lumber, to the value of 47,000 paper roubles; nut and palm wood, 153,000 pounds; various seeds, 29,000 pounds; flax and combed flax, 6,000 pounds; skins, 8,000 pounds; hides, 15,000 pounds; wool unspun, 194,000 pounds; naphtha and its products, 26,146,000 pounds; liquorice 107,000 pounds; and manganese ore, 722,000 pounds; from 1886 to 1892 the export of mineral lighting oil was successively as follows: 6,900,000; 9,000,000; 21,100,000; 29,400,000; 36,200,000; 41,100,000; 44,100,000. In 1891, 3,100,000 pounds of lumber were brought from abroad, chiefly for the making of tanks for kerosene, without reckoning 1,900,000 of Russian lumber obtained by the coasting trade.

Of the finished wares the principal imports were: faïence and porcelain, 1,000 pounds; glass, 3,000 pounds; wrought cast-iron, 35,000 pounds; iron and steel wares, 86,000 pounds; machines and apparatus, 35,000 pounds; paper wares, 3,000 pounds; flax and hemp goods, 6,000 pounds. A considerable part of the goods imported through Batoum, about 22 per cent, if tin be not reckoned, are brought to the customhouse of Tiflis, whence they are distributed for the interior consumption.

*The land frontier of the Caucasus and the Caspian Sea:* The returns of the foreign trade across the Russo-Turkish frontier are inconsiderable, and do not exceed yearly the sum of 300,000 roubles for the import, and an equal amount for the export; the principal article of import is grain, 146,000 pounds in 1891; and of the export, rams and sheep, in 1891, 4,000 head.

The trade with Persia is carried on: 1. through the customhouses of the Russo-Persian frontier; 2. through those of the ports of the Caspian Sea; 3. by land, from the eastern coasts of this sea, by means of the Transcaspian Railway from Ousoun-Ada to Askhabad, and then farther to Meshed. Unfortunately there are but few data relating to the turnover of the latter trade. During the period from 1886 to 1890 across the Russo-Persian land frontier goods were imported to an average value of 4,000,000 roubles paper, and in 1891, to 3,300,000 roubles; the export for the same period averaged 1,000,000 and 1,400,000 roubles paper.

The import by sea from Persia reached in 1891, 7,600,000 roubles, including the wares brought to the Ousoun-Ada customhouse by land, on which a 5 per cent duty had been levied, as the full duty installed for the Persian wares is placed on such goods as go to the other ports of the Caspian Sea. The export by sea amounted to 8,500,000 roubles. According to the customhouse data, the total import of goods from Persia for 1891 may be estimated at 10,900,000 roubles, and the export thereto at 9,900,000 paper roubles; thus the import exceeds the export by one million paper roubles.

The returns of separate Caspian customhouses reached in 1891 the following amounts: Baku, import 3,500,000; export, 8,900,000; Astrakhan import 3,200,000; export 1,500,000\*; Ousoun-Ada import of wares on which a 5 per cent duty had been levied, 900,000; export by sea, 30,000 paper roubles. As to the export trade of Astara it has no importance, for in the traffic with Persia all the cargoes are carried by land to Ardebil, and to the Astara port they are brought as articles of the coasting trade, belonging therefore to the interior trade.

---

\* These figures refer only to the trade with Persia, as the traffic with the khanates of central Asia will be treated separately.

*The Central Asiatic frontier:* Goods manufactured in Central Asia are imported through Astrakhan free of duty; in 1891 their value reached 1,900,000 roubles paper. On all the wares brought to the Transcaspian province, and not carried by sea to Astrakhan or Baku, a pach is raised; among such wares, besides those of the Central Asiatic production, are some of the Persian, English colonial (East Indian) and other wares. The pach is not returned if the wares are further exported from the Transcaspian province, and even if they are carried to the Russian Turkestan. In 1891 the pach was raised on wares to the value of 3,200,000 paper roubles.

Across the Central Asiatic frontier to Russian Turkestan taxed goods were imported to the value of 1,600,000 and untaxed to that of 2,300,000 roubles paper. Wares to the value of 4,200,000 roubles were carried across the some frontier to the khanates of Central Asia. On considering, moreover, that in 1890 goods were imported from Russia and Bokhara to Afghanistan for the sum of 3,900,000 roubles; and into Russia and Bokhara from East India, Kaboul, and Afghanistan to the value of 4,000,000 roubles, it will be plainly seen that the traffic on the area between the eastern coast of the Caspian Sea and the western frontier of Russian Turkestan has now reached such dimensions, as were unthought of a few years ago. The figures showing the absolute turnover are, however, of less importance than the general results obtained in so short a period, owing to the pacifying of the country by the Russians, and especially less than the numerous beneficial results gained by the building of the Transcaspian Railway.

A regular trade traffic exists and has long existed through Orenburg; by this way a quantity of cotton is carried to European Russia from Central Asia, but since the establishment of steamboat communication along the river Amu-Darya, which renders it possible to bring the cargoes to the station Chardjouy of the Transcaspian Railway, this quantity has considerably diminished.

The ceaseless riots in the neighbouring Afghanistan hindering the traffic between East India and Bokhara, together with the convenience and cheapness of the carriage by the Transcaspian Railway, induced the tradesmen to bring the East Indian tea and English cotton tissues through Bender-Boushir and Meshed to Doushak and Askhabad, from whence they reach Bokhara and farther by the railway.

If the goods carried through Khiva and Bokhara as transit wares be not counted the principal articles of the trade between European Russia and Russian Turkestan in this region were the following. Through Astrakhan and Baku there were exported in 1891, excluding the sugar sent to Persia, 266,000 pounds of raw and 181,000 pounds refined sugar; on the whole 447,000 pounds, out of which 130,000 pounds were carried to Russian Turkestan; the other 317,000 pounds show the consumption of the Transcaspian province and of the adjoining countries. In the mean time 1,340,000 pounds of raw cotton were imported into Russia and the Caucasus from Central Asia, not counting the 1,433,000 pounds exported from Russian Turkestan. Tea was imported into the Transcaspian province in a quantity of 70,000 pounds on which the *pach* was raised; across the Central Asiatic frontier 37,000 pounds were brought to Turkestan. The above-mentioned wares have a great importance to Russia with regard to the fisc, and the direction of their traffic is already quite definite. Relatively to the other wares, and especially to all sorts of finished goods, it is impossible to state from the data given, the details and

dimensions of the trade traffic. The former ways have now been left off; the Transcaspian Railway has gained great importance and serves as the principal line for all Central Asia, but the dimensions of the normal returns of its trade with Russia are as yet not finally determined, as the contest for the markets of Central Asia is still prevailing.

The principal wares on which in 1891 the *pach* was raised, besides tea and raw cotton were: raw wool, 98,000 pounds; grain, 186,000 pounds; flour, 177,000 pounds; dried fruit, 70,000 pounds; animals, to the value of 144,000 roubles paper. The total value of the goods on which the *pach* was raised amounted to 3,200,000 paper roubles, out of this sum 48 per cent fell to foodstuffs, 30 per cent to raw and half-manufactured goods, 5 per cent to animals, and 17 per cent to finished wares. Besides tea, the principal wares imported to Russian Turkestan were: grain, 177,000 pounds; fresh fruit, 34,000 pounds; almonds, 17,000 pounds; undressed hides, 11,000 pounds; animals, to the value of 66,000 roubles paper; all kinds of tissues, estimated at 485,000 roubles, et cetera.

Of the wares exported from Russian Turkestan to the neighbouring khanates the principal were: grain, 1,800,000 pounds; dried fruit, 38,000 pounds; grape wine, 8,000 pounds; various seeds, 53,000 pounds; animals, to the value of 370,000 roubles; cotton fabrics, 9,000 pounds. As to the wares imported from European Russia and the Caucasus to Ouzoun-Ada, it is impossible to separate those intended for the Transcaspian interior trade; however, from the return of the Transcaspian Railway it may be seen that in 1890 from Ouzoun-Ada the following cargoes were sent by that railway: manufactured goods, 541,000 pounds; kerosene, 135,000 pounds; groceries 19,000 pounds; porcelain plates, 22,000 pounds; cotton yarn, 60,000 pounds; brandy and liquors, 26,000 pounds.

The general value of the wares brought to Bokhara may be fixed at 17,000,000 roubles, and that of those exported, at 15,000,000 roubles paper. The principal products in which Bokhara abounds are: cotton, wool, sheepskins (*karakouli*), raw silk, dried fruit, carpets, tissues, et cetera. The distribution of the export and import of these goods to different countries will now follow the laws of demand and offer general to all the Russian parts of Central Asia.

*Russian-Chinese frontier*: In 1891 there were brought wares from China, through the customhouses of the Turkestan district, to the value of 1,200,000 roubles, and through the customhouses of the Semipalatinsk customs districts, to that of 800,000 roubles, or on the whole, to the value of 2,000,000 roubles paper. In the same year the export through both of these points of the frontier reached 3,200,000 roubles. In these figures the value of the Chinese cotton tissue, called *daby* brought from Kashgaria to Kouldzha transit through Issyk, Koulsk district, is included.

Besides cotton tissues the chief imports through the above-mentioned customhouses were: woollen goods, 23,000 pounds; wool, 56,000 pounds; undressed hides, 21,000 pounds; pelts, 15,000 pounds, all these being mainly products of cattle breeding. Conformably to this, the chief exports from Russia were: sugar, 9,000 pounds; grain, 42,000 pounds; vegetables, 12,000 pounds; candles, 2,000 pounds; mats, 7,000 pounds; dyes, 4,000 pounds; unwrought metals, mainly iron, 43,000 pounds; metallic wares, 14,000 pounds; horses, 7,000; rams and ewes, 30,000. Thus, in the export foodstuffs and products of the mining industry prevail over other articles.

The small dimensions of the turnover are to some extent explained by the fact mentioned in the customs return for 1891, namely the stoppage of the exportation of tea from China across the western frontier, as after the measures taken by the Russian Government it cannot be done free of duty; under these measures the recent establishment of a regular supervision of the whole Russo-Chinese frontier from Afghanistan to the Souoksk summit must be understood. Another reason retarding the trade in the district is the fact, that Western China does not produce any other export except *daby*, the import of the Russian wares thereto depending therefore greatly on the receiving of the *yamb* silver from Interior China, for support of the army and administration. This silver is used in payment for the Russian wares; the Russian traders send these *yamb*s to Kiakhta in exchange for tea. Besides, it should be mentioned that the export of cattle, which in 1891 amounted only to 234,000 roubles, as compared to that of 1884 reaching 533,000 paper roubles, was abnormally small, thus explaining the insignificant excess of the export value over the import in that year.

At the frontier of the Ussinsk district of the Yeniseisk government a trade by barter is carried on with the Uriankhaisi, whose villages are situated along the upper part of the river Ussa. The value of the wares obtained in this way in 1891 may be fixed at 100,000 roubles. Russia receives principally pelts, 33,000 pounds; and exports, besides cotton fabrics (191,000 arshines), an inconsiderable quantity of tobacco, leather, horn, and iron wares. In 1890 a lot of tea was brought for trial through the town of Minussinsk, floating down the river Yenisei; the cost of the transport by this way appeared to be less than by sending it through Kiakhta.

The principal customhouse for the Russo-Chinese trade by land is the Irkoutsk, situated about 600 versts from the frontier. Before the giving of the permission to bring tea to European Russia straight by sea, all the teas imported to the Empire passed through Irkoutsk. Owing to the rising consumption of tea in Russia, the traffic in Kiakhta teas has not decreased even until now, notwithstanding the considerable dimensions the import thereof by sea had reached.

Besides tea there are yearly brought to the Irkoutsk customhouse some thousands of pounds of Chinese silken tissues, some other Chinese wares, and European goods sent by post. The total value of the wares imported through the Irkoutsk customhouse averaged, from 1886 to 1890, 22,000,000 roubles paper, and in 1891, 13,000,000 roubles. Tea for interior consumption was sent out as follows: Bohea tea in 1889, 416,000; in 1890, 302,000; in 1891, 302,000; in 1892, 379,000 pounds; brick tea, in 1889, 763,000; in 1890, 668,000; in 1891, 775,000; in 1892, 806,000 pounds; cake tea, *plitochny*, in 1889, 10,000; in 1890, 32,000; in 1891, 33,000; in 1892, 32,000 pounds.

The fluctuations in the figures referring to Bohea tea depend to a certain degree on the demands of the markets of European Russia. The increase in the import of brick tea is explained by a large consumption thereof in Siberia, as well as by the fact that its use begins to spread in the eastern governments of European Russia. The cake tea, *plitochny*, serves as a surrogate to the cheaper sorts of the Bohea tea; the consumption thereof does not decrease, although in 1891 the duties thereon were raised from 6 roubles to 10 roubles in gold per pound. The wares are brought to the Irkoutsk customhouse for the greater part through Kiakhta, the

remainder of them by the river Amour, but the transport by this last way increases yearly.

Not all the Chinese wares brought through Kiakhta are carried to Irkoutsk, some of them are sent to Verkhneoudinsk and other localities of the Transbaikalia, and further to Chita and Blagoveschensk on the Amour. The trade returns furnished by the older Kiakhta merchants can serve as materials to judge of the export trade of the Irkoutsk region. From 1886 to 1890 the value of the Russian goods exported to China through Kiakhta was on the average 1,800,000 paper roubles, and in 1891, 1,500,000 paper roubles. The principal exports were: cloth, 150,000 arshines; cotton fabrics, from 800,000 to 900,000 arshines; horns of the saiga and the roe deer, to the value of 140,000 roubles; leather, to the value of 275,000 roubles; and furs, for 300,000 roubles.

Besides this, foreign furs were exported, in 1892, to the value of 76,000 roubles; and Chinese wares, such as tea, sugar, and sugar candy, were in an inconsiderable quantity imported from China.

*Littoral region:* According to the data given by the local Governor-General, in 1885 wares, with the exclusion of tea, were imported to the Amour region for the sum of 8,300,000, and in 1889, to 10,000,000, paper roubles. The import to the ports of Eastern Siberia was as follows: from Hamburg in 1890, to the value of 2,200,000, and in 1891, to that of 2,400,000 German marks; from the United States of America in 1890 to 1891, to the value of 200,000, and in 1891 to 1892, to that of 100,000 dollars; from China, mostly tea, in 1890 for the sum of 600,000, and in 1891 for that of 900,000 taels; from European Russia in 1890, to the value of 11,700,000, in 1891, to that of 14,200,000, and in 1892, to 13,200,000 roubles paper. Of the wares subjected to customs duties in 1891 were imported: 5,000 pouds of spirits, and 2,000 pouds of matches. In general, all kinds of finished wares and foodstuffs constitute the import.

The export trade of the Littoral region may be seen from the following figures. The principal goods exported to the United States of America are furs; in 1890 to 1891 their export value reached 100,000, and in 1891 to 1892, 300,000 dollars. The principal exports to China are sea cabbage, gentian, and fish, reaching in 1890, as well as in 1891, to the value of 200,000 taels. The Russian Sealskin Co. reports that in 1891 the export of sealskins from the Commander Islands reached 319,000 roubles gold, and 1892, 365,000 roubles in gold.

From the above given data it may be seen that in the export trade of the Littoral region, European Russia tends of late to outrival other countries. The further development of the marine trade of Eastern Siberia depends on local conditions, as much as on the course the activity of the Russian Free Fleet will take.

#### TRADE WITH FINLAND.

The value of the import from 1886 to 1890 inclusive was successively as follows: 9,900,000; 10,800,000; 11,400,000; 13,300,000; 13,400,000, or on the average, 11,700,000 paper roubles; out of this, 22 per cent fell to foodstuffs; 37 per cent, to raw and half-manufactured goods; 4 per cent, to animals; and 37 per cent, to finished wares.

The export value for the same period was successively as follows: 16,600,000; 17,000,000; 19,300,000; 17,600,000; 16,700,000; or on the average 17,400,000 paper roubles, distributed among the kinds of wares in the following way: foodstuffs, 53 per cent; raw and half-wrought materials, 17 per cent; finished wares, 30 per cent. The total export exceeded the total import on the average by 5,700,000 paper roubles; namely, the export exceeded the import of foodstuffs by 6,700,000 paper roubles; of finished goods, by 900,000 paper roubles; on the contrary, raw and half-manufactured goods were imported to a value exceeding the export value thereof by 1,400,000 roubles; the import of animals also exceeded the export by 500,000 paper roubles. Of the foodstuffs the principal exports were: grain, 5,554,000 pounds; meat, 35,000 pounds; cow butter, 34,000 pounds; eggs, 3,500,000 pieces; confectionery and jam, 17,000 pounds; gingerbread and all kinds of pastry, 10,000 pounds; sugar, 44,000 pounds; tobacco, 146,000 pounds; and the principal imports: cow butter, 130,000 pounds; herrings and other fish, 111,000 pounds.

Of raw and half-manufactured goods the chief exports were: raw and combed flax, 46,000 pounds; hemp and tow, 36,000 pounds; bones, 127,000 pounds; rags, 69,000 pounds; hides, 20,000 pounds; wool unspun, 5,000 pounds; naphtha products, 476,000 pounds; apothecary wares, 14,000 pounds; vegetable oils, 53,000 pounds; and the imports: lumber, to the value of 911,000 paper roubles; dressed hides, 31,000 pounds; flax and hemp yarn, 18,000 pounds; wood-paper mass, 518,000 pounds; unwrought cast-iron, 335,000 pounds; iron, 467,000 pounds; brass, 18,000 pounds; tannin, 215,000 pounds.

Of the finished wares the principal articles of export were: metallic wares, to the value of 410,000 paper roubles; flax and hemp wares, 52,000 pounds; woollen, 6,000 pounds; cotton tissues, 52,000 pounds; wood wares, 87,000 pounds; guttapercha and India rubber wares, 15,000 pounds; perfumed and ordinary soap, 23,000 pounds; candles, 31,000 pounds; those of the import: faïence wares, 10,000 pounds; glass wares, 154,000 pounds; wrought cast-iron, 26,000 pounds; iron and steel wares, 26,000 pounds; machines and apparatus, 7,000 pounds; paper wares, 740,000 pounds; flax and hemp goods, 13,000 pounds.

In 1891 there were imported to Russia from Finland duty free: 400,000 pounds of unwrought cast-iron; 385,000 pounds of all sorts of iron; 18,000 pounds of machines and apparatus; 47,000 pounds of cotton fabrics; 7,000 pounds of faïence wares; 28,000 pounds of brass; 7,000 fox pelts; and some other wares in inconsiderable quantities.

The import across the land frontier, the cargoes brought by rail included, during the period of 1886 to 1890 constituted on the average 67 per cent of the total import value; 28 per cent fell to the import by sea, and 5 per cent to that by Lake Ladoga through Schlüsselburg. In the export, 55 per cent of the value fell to the land frontier; 43 per cent, to the export by sea; and not more than 2 per cent to that by Lake Ladoga. The Finnish goods are mainly carried to St. Petersburg; the wares exported to Finland are almost exclusively freighted in St. Petersburg. Namely, the import to St. Petersburg by rail amounts to 7 million roubles; by sea, to 2 million roubles; and by the Neva, to 500,000 roubles; or on the whole, to nine and a half million roubles, forming over 80 per cent of the total import from Finland. The export from St. Petersburg by different tracts equals 16 and a half million roubles, or over 95 per cent of the total Russian export to Finland.

The Finnish wares are carried also in considerable quantities to Reval (fish), and to Riga (iron and bottles.)

#### TRADE AT THE MOUTHS OF THE PECHORA, OBI, AND YENISEI RIVERS, AND ON THE MOURMAN COAST.

The coasts of the Arctic Ocean were known to the Russian traders already in the sixteenth century, where an exchange trade was going on; namely, fish and furs were exchanged for very ordinary iron wares, grain, clothes and crockery, such a trade proving very advantageous. At present the extreme north is again attracting general attention; measures are sought to enhance the economical welfare of the inhabitants of the coast, and the establishment of regular mercantile relations between the extreme northern region and the larger trade centres is greatly increased. As no permanent customs institutions exist in the above-mentioned places, it is impossible to have current notes of the turnover of the trade carried on along the coasts of the Arctic Ocean. Only fragmentary data upon the subject are to be found, which, however, give reason to suppose that even this remote outskirt may under certain conditions be of some importance to the Empire.

The mouth of the river Pechora has long ago served as an outlet to the sea for the products of an immense region comprising even a part of Siberia. The principal exports from here are deer skins, hides, and tallow; hence are also brought all kinds of pelts and Karsk fish from the Yugorsk Round to be sent abroad. The articles of import were: salt, oliveoil, kerosene, tobacco, rice, and ground colours.

In the first half of the present century a conviction was formed that the Kara Sea was not navigable. This opinion was refuted, thanks to the exclusive endeavours of one of the eminent Russian promoters, Sidorov, and in the seventies a series of attempts, more or less successful, were made to establish direct mercantile relations with the interior of Siberia, with the view of carrying the wares by sea and up the rivers Obi and Yenisei. The most successful voyages were those of Captain Dale on the ship «Louisa», which went up the rivers Obi and Irtysh to Tobolsk; and of the celebrated traveller Nordensjöld on the yacht «Vega», entering the Yenisei. In 1888 the steamer «Neptune» came from Hamburg to the Obi Bay; and Baron Knoop brought a cargo from the coasts of the Yenisei to Bremen on the «Moscow». During the same year an English steamer «Phoenix» under the command of Wiggins, which tried already in 1874 to reach Siberia by sea, came as far as Yeniseisk. Finally in 1890 three English steamers «Biscay», «Touley» and «Bard» reached successfully the borders of the Yenisei, bringing wares to the value of 300,000 roubles, among which there were: 31,000 pouds of different metals; 13,000 pouds of metallic wares; 5,500 pouds of kerosene; further, salt, cables, olive oil, cement, et cetera. These wares were sold in Krasnoyarsk, Tomsk, and Irkutsk. The steamers went back with cargoes of grain and meat.

In order to further the marine trade with the north of Siberia, different persons were allowed to carry wares to the mouths of the rivers Obi, Yenisei, and Lena free of duty. In the present year an order was issued by the Emperor to organize a special expedition for a new investigation of the Yenisei Bay and river. The fishermen, mostly peasants of the Onega and Kemsk districts, have disposed their

settlements, *stanovischi*, along the Mourman coast. The fish is partly sent to Archangel, partly goes by sea to the Baltic ports. The salt needed by the fish traders is brought from abroad with no duty levied thereon; but since 1886 the import of foreign spirits to the Mourman coast is prohibited.

#### IMPORT AND EXPORT OF UNWROUGHT GOLD AND SILVER.

In general, Russia exports gold and receives silver from abroad, as the home production thereof does not answer the demands of the Russian industry and trade. The total import of gold for the period of 1887 to 1892 was successively as follows: across the European frontier: 104; 1,268; 125; 1,028; 5,046; 7,388 pounds; and across the Asiatic frontier: 35; 62; 66; 97; 104; 43 pounds. The total export was, across the European frontier: 1,179; 2,188; 1,233; 1,131; 13; 11 pounds; and across the Asiatic frontier: 17; 37; 9; 73; 31; 5 pounds. For the same years silver was imported successively as follows: across the European frontier: 3,525; 11,106; 10,811; 8,939; 9,447; 9,640 pounds; and across the Asiatic frontier: 845; 1,271; 1,263; 1,570; 5,587; 3,441 pounds. The export was, across the European frontier: 74; 34; 130; 2,764; 25; 32 pounds; and across the Asiatic frontier: 3,213; 4,565; 4,177; 2,957; 7,600; 6,038 pounds.

Thus, from 1887 to 1890, the export of gold exceeded the import thereof successively by: 1,057; 895; 1,051; and 79 pounds; while in 1891 and 1892 the import exceeded the export by 5,106 and 7,415 pounds; meanwhile during all the period there was an excess in the import of silver, namely by: 1,083; 7,778; 7,767; 4,788; 7,409; and 7,011 pounds. The foreign trade in gold is principally carried on across the European frontier, and only across this frontier the import and export of gold in ingots is noticed; as for silver, it is almost exclusively brought in ingots across the European frontier; a certain quantity of silver in ingots is exported across the Asiatic frontier, and a still smaller part is exported in the shape of Persian coin.

It should be mentioned, however, that the above given figures do not show the total quantity of precious metals carried across the frontier of the Empire. The amounts of gold and silver carried by travellers, and those transported as baggage, are not signified to the customhouses and therefore not included in the above figures.

The movements of gold for the latter years are chiefly explained by the operations of the State Bank tending to concentrate a great quantity of gold in St. Petersburg; thus, according to official data, there were in St. Petersburg in December 16 (28), 1891, 404,700,000 roubles in gold, and in December 16 (28), 1892, 528,000,000 roubles in gold, not reckoning the gold the Government had abroad (106,800,000 and 76,400,000 roubles in gold). In the figures of the import and export of silver, across the Asiatic frontier, the Chinese yambs are included which, are chiefly imported to Western Siberia and exported through the Irkutsk custom-house.

#### CUSTOMS DUTIES.

*Customs tariffs:* The foreign wares imported across the European frontier are subjected to customs duties according to the general tariff confirmed in 1891, with



the exclusion of the ports of Finland, where the duties are levied according to the special tariff of Finland.

For the wares imported through the customhouses in the Caucasus the duties are as follows: *a.* at the Black Sea coast, according to the tariff for the import across the European frontier; *b.* at the land frontier with Turkey and Persia, for Asiatic wares, 5 per cent of the value in gold; for European wares and Persian tobacco grown from American seed, according to the tariff of the European frontier; *c.* at the Caspian ports of the Caucasus and at the customhouse of Astrakhan, for the wares of European origin, according to the tariff of the European frontier; for the wares of Persian origin, 5 per cent of the value in gold, except fish cured with Russian salt, the duty thereon being diminished by 4.5 kopecks per pound; wares of Central Asia are allowed to be imported free of duty.

In the bounds of the Transcaspien region the duties levied on foreign goods amounted to 2.5 per cent of their value in paper roubles. If the wares be brought from Ousoun-Ada to Astrakhan or the Caucasian ports, an additional duty to the full amount is levied; namely to 5 per cent of the value on Persian goods, and on the European wares according to the tariff table established for wares brought across the European frontier.

On the wares imported through the customhouses of the Turkestan customs region, that is, of the Turkestan Governor-Generalship and of a part of the Semirechinsk district, duties are levied according to a mixed tariff, namely: on some of the Anglo-Indian wares in dimensions specially established for that region, such as 14.40 paper roubles per pound on green tea; 6 paper roubles per pound on indigo; and 1 paper rouble per pound on muslin; on the other wares duties are levied according to the tariff in force for the goods imported across the European frontier, but in paper values instead of gold, conformably to the exchange accepted by the Government revenue roll. On brick tea a duty of 4 paper roubles per pound is levied, and on Bohea tea, 21 roubles are levied per pound.

Furthermore, on the Chinese frontier within the boundary of the Semipalatinsk customs region, and at the Irkutsk customhouse, duties are levied only on tea, namely: on Bohea tea, 13 roubles in gold per pound; on cake tea (plitochni) bearing the mark of Russian factories, 10 roubles in gold per pound; and on brick tea, 2.50 roubles in gold per pound. Other wares of Chinese origin are imported duty free; the European wares brought through the Irkutsk customhouse and those of the Semipalatinsk district are subjected to duties of the general tariff. The exchange trade carried on with the Ouriankhaitsi is practically free. Of the goods brought through Vladivostok and Nikolaevsk on the Amour, duties are levied according to the general tariff on spirits, naphtha, sugar, matches and spirit varnishes; in general, on excised articles, other wares being allowed to be imported free.

Export duties are levied only on rags, crude bone, unground phosphorites, calamine, brass and lead ores, palm wood and nut wood spunk, and only in the case when they are exported across the European frontier and across the Black Sea coast of the Caucasus. There are no transit duties in Russia.

Wares brought from Finland, being of local make, are not subject to duty; regulating taxes are only placed on some of the goods, as has already been mentioned, namely: on wood paper mass, paper, wall paper, and the like; on unwrought

cast-iron and iron; on iron wares and the like; on cotton yarn, hides, faïence, and glass wares; moreover, with regard to some of these articles, duties are only levied on quantities exceeding the definite standard. The dimensions of the duties on Finnish goods are on the average considerably lower than the general customs dues. No export duties are levied on goods sent to Finland. In Finland duties are levied on the following Russian wares: on liquors, sugar, sirup, tobacco, and salt; the import of brandy is totally prohibited. Export duties are levied on bone, and unsawn timber sent to Russia.

*The returns of the customs duties on imported goods:* The general amount of the customs duties levied on imported goods was as follows: in 1869, 39,600,000 paper roubles; in 1879, 63,200,000 roubles in gold; in 1889, 81,300,000 roubles; in 1890, 83,500,000 roubles; and in 1891, 80,300,000 roubles in gold.

The rapid growth of these revenues is explained by the gradual increase in the dimensions of the customs dues; by the placing of duties upon such wares as were formerly (by the tariff of 1869) allowed to be imported free; by the establishment of customhouses at such points of the Asiatic frontier as were formerly unprotected; and by the general development of the trade returns in Russia. During the above mentioned years, according to the data of the State Control, the amount of the duties levied on goods imported across the European frontier, the trade with Finland included, was: in 1869, 38,200,000 paper roubles; in 1879, 60,600,000 roubles in gold; in 1889, 71,200,000 roubles in gold; in 1890, 75,300,000 roubles in gold; and in 1891, 72,200,000 roubles in gold. It may be seen that the amount of the duties levied at the European frontier forms over 90 per cent of the total return. Out of the sums received at the Asiatic frontier over 75 per cent fall to the Irkoutsk customhouse.

The total amount of the duties levied at the European frontier on imported goods is distributed as follows, with regard to the class of wares: the duties levied on foodstuffs formed in 1892, 39 per cent of the total sum, while in the period from 1869 to 1873 they formed 51 per cent; the duties on raw and half-manufactured goods formed 44 per cent in 1892, and 20 per cent for the period of 1869 to 1873; those on finished wares equalled 17 per cent in 1892, and 29 per cent in 1869 to 1873. Thus the amount of the duties on raw and half-wrought materials has increased the most in all this time.

The largest revenue was given in 1892, on the whole, by tea, namely, 24,500,000 roubles in gold. The principal revenues gathered by the customhouses of the European frontier relate to: raw cotton, 11,400,000 roubles in gold; grape wine, 2,500,000 roubles; herrings, 1,800,000; machinery and apparatus, 3,700,000; chemical products, 2,500,000; woollen wares, 1,100,000; woollen yarn, 1,500,000; cast-iron, 1,500,000; iron, 1,800,000; coal and coke, 1,400,000 roubles in gold.

The ratio of the customs duties to the value of the goods equalled on the average, for all those brought across the European frontier, as follows: in 1869, 12 per cent; in 1879, 17 per cent; in 1889, 28 per cent; during the first eight months of 1890, 28 per cent, in the four last months, 30 per cent; in the first half of 1891, 29 per cent, in the second, 37 per cent, and in 1892, 34 per cent.

According to the classes of wares, the ratio between the customs dues and the value of the goods may be given for the same years, and parts of the years success-

ively, as follows: for foodstuffs: 31, 41, 71, 71, 69, 68, 82, and 79 per cent; for raw and half-wrought materials: 5, 10, 19, 17, 22, 19, 24, and 23 per cent; and for finished wares: 9, 15, 28, 27, 28, 32, 32, and 29 per cent.

The highest duties comparatively to the value are levied on foodstuffs, with view of increasing the fisc; furthermore, finished goods are comparatively taxed higher than raw and half-wrought materials.

*The returns of the customs duties on exported goods:* According to the data of the State Control the returns of the export customs duties were: in 1869, 296,000 paper roubles; in 1879, 122,000 roubles in gold; in 1889, 231,000 roubles in gold; and in 1891, 182,000 roubles in gold; the fluctuations in the figures of these revenues depend greatly on the dimensions of the export of rags across the European frontier, and of palm and nut wood across the Caucasian frontier.

When in 1891 the export duty on unground phosphorites was raised from 10 to 12 kopecks in gold per poud, its exportation ceased altogether, as it was found more advantageous to grind them before sending them abroad. It must be mentioned, however, that in 1892 the export of phosphorites exclusively in the ground state (466,000 pouds), exceeded the import of all kinds thereof in 1891 (417,000 pouds, out of which 100,000 pouds of ground phosphorites).

#### FOREIGN NAVIGATION.

In 1890, on the whole, 10,806 vessels, measuring 6,975,000 register tons, came to the ports of the external seas, the White Sea, the Baltic (Finnish ports excluded), the Black, and the Azov seas; and 10,640, measuring 6,941,000 register tons departed; of these came under the Russian flag 1,387, measuring 612,000 register tons, and 1,225 vessels, measuring 570,000 register tons, left the ports under the same flag, their number forming 12 per cent of the total, and 9 per cent with reference to measurement. The average tonnage of the vessels on which the Russian flag was hoisted is 468 register tons, being thus under that of the foreign vessels measuring on the average 676 register tons. Furthermore, 36 per cent of the total number fall to the vessels under the Union Jack, their measurement equalling 55 per cent; next come the German vessels, 16 per cent, and 11 per cent of the measurement; the Sweden-Norway, 14 per cent, and 8 per cent of the measurement; the Danish, 10, and 9 per cent; the Greek, 7.5, and 4.5 per cent; the Turkish, 7, and 1 per cent of measurement; those of the other countries forming a still smaller per cent. These figures show also that, with regard to measurement, the first place is held by the English vessels, and the last by the Turkish. In particular the number of vessels arrived was 7,711, measuring 3,176,000 register tons, and of those that left, 7,613, measuring 3,164,000 register tons, these figures forming 71 per cent of the total number and 91 per cent of the average measurement.

Of the vessels that arrived, those under the Russian flag were 654, measuring 243,000 register tons; and of those that left 559, measuring 226,000 register tons; thus, the Russian steamers formed 7 per cent of the total amount of the navigation with regard to the number, as well as to the measurement. The number of the arrivals with goods formed 44 per cent of the total number of vessels, 42 per cent of steamers, 76 per cent of the total number of Russian vessels, and 72 per cent of

Russian steamers; the ratio of the departing vessels was conformably to this as follows: 90, 91, 93, and 91 per cent.

If the average weight of the wares forming the import and export of the foreign trade be compared to the figures showing the total measuring of the vessels arrived and departed in foreign navigation, an idea can be formed as to the degree of the loading of the vessels arrived and departed at each of the seas separately.

For this purpose, only such totals must be taken into consideration, as cover cases of navigation between Russian ports of the same sea (quasi coasting), that is to say, that cases, where a vessel entered successively some of the ports of the same sea in order to unload foreign goods or take cargoes of Russian wares, were excluded; if this condition be kept, each vessel should be counted with reference to the number of voyages it made, and not to the number of ports it visited. The importance of such a correction may be seen from the fact that, in 1888 to 1890, there were on the average arrivals referring to quasi-coasting 229, to the Baltic Sea; 738, to the Black and Azov seas, the average yearly measurement of vessels being 138,000 register tons in the Baltic Sea, and 671,000 in the Black and Azov seas.

In order to fix for the above-mentioned purpose the total quantity of the wares of the foreign import and export it is necessary to add to the data, showing the amount of goods imported for consumption and that of the Russian goods sent abroad, the quantity of the wares brought in transit across the Empire, as well as of the wares which have been sent back to foreign countries or returned from there.

On obtaining the data necessary for the above mentioned comparison, it will be seen that in 1888 to 1890, the average measurement of the vessels departed from the White Sea was 183,000 register tons; from the Baltic Sea 2,879,000 register tons, and from the Black and Azov seas, 3,651,000 register tons. The total weight of the wares exported during the same years across the White Sea frontier equalled 14,800,000 pounds; across the Baltic frontier, 223,500,000 pounds; and across the Black and Azov frontier, 375,500,000 pounds.

Thus one register ton of measurement equalled approximately 81 pounds of the export from the ports of the White Sea, 77 pounds from the ports of the Baltic, and 103 pounds from the ports of the Black and Azov seas. These average numbers are considerably smaller when referring to the vessels arrived from abroad. The average total weight of the wares imported across the White Sea frontier was 1,500,000 pounds; across the Baltic, 124,000,000 pounds; and across the Black and Azov Sea frontier, 31,900,000 pounds.

Without mentioning the data referring to the total amount of measurement of the vessels arrived from abroad, as they are nearly equal to those of the vessels departed, it may, however, be seen that on the average one register ton of the vessels arrived at the ports of the White Sea equalled 8 pounds of wares; of those arrived at the Baltic ports, 43 pounds; and at the Black and Azov sea ports, 9 pounds. It may be seen from these data to what degree the goods brought from abroad act as ballast.

The total return of the navigation for 1891 is distributed with regard to the different seas as follows: to the White Sea 6 per cent of the number of vessels, and 3.3 per cent of the measurement; to the Baltic, 52 and 41.1 per cent; to the Black and Azov seas, 42 and 55.6 per cent. The navigation is more intense in the southern

seas. The average measurement of the vessels entering the White Sea ports is 356 register tons; the Baltic, 512 register tons; and the Black and Azov ports, 856 register tons. The largest vessels are seen in the southern ports. Thus, of the vessels going abroad and drawing more than 20 feet of water, 444 left the port of Odessa; 172, Batoum; 67, the Novorossisk port; 47, Sebastopol; 39, Taganrog; and not more than 38, those of St. Petersburg and Cronstadt.

The navigation of steamers is distributed among the separate seas so that 3 per cent of the number and 2.6 of the measurement fall to the White Sea; 56 and 40.4 per cent, to the Baltic; and 41 and 57 per cent, to the southern seas, the movement of navigation there being comparatively the greatest.

If the navigation be considered with reference to separate months, it will result that in 1891 the maximum for all the external seas with regard to the number of vessels as well as to their measurement fell to the month of August. In particular, the navigation of the White Sea began in May, and lasting to November, was most intense in June; of the Baltic, in August; and of the southern seas, in May with regard to the number, and in August, with regard to the measurement.

The principal ports were: those of the White Sea, the total number of vessels being 1,035, measuring 358,000 tons register; of the Baltic: the St. Petersburg-Cronstadt port, 3,046 vessels, measuring 1,954,000 register tons; Riga, 3,686 vessels and 1,848,000 tons; Libau, 2,648 vessels and 1,124,000 tons; Reval, 788 vessels and 482,000 tons; of the Black and Azov seas: Odessa, 2,223 vessels, measuring 2,604,000 tons; Batoum, 1,865 vessels, 1,598,000 tons; Taganrog, 1,446 vessels, 1,010,000 tons; and Nikolaev, 572 vessel, 658,000 register tons. Thus, according to the number of vessels, the most considerable port is Riga on the Baltic Sea; and according to the measurement of the vessels, Odessa on the Black Sea.

The data given relative to the navigation of the remote east show that, in 1891, 111 vessels entered Vladivostok, measuring 97,000 register tons; and Nikolaevsk on the Amour, 33 vessels measuring 19,000 tons. Besides these two ports, the vessels of the Volunteer Fleet enter also some other points on the coast of Eastern Siberia, namely: Dekastri, the Bay of Possiet, Okhotsk, Ajan, Ghizhiga-Udsk and others. This movement of Russian trade vessels is quite a new thing, and all the data give reason to suppose the possibility of a further development of the marine trade of Eastern Siberia.

#### TRANSIT TRADE.

##### *Transit trade of foreign goods through the Empire.*

The wares destined to an uninterrupted passage through the Empire are declared to be transit goods, in order to escape the payment of import or export dues, and to shorten in general the formalities relating thereto. Of course such kinds of wares as are not subject to any special duties either for the import or export, and therefore allowed to cross the frontier with less formality, may be carried through the Empire without being declared as transit goods, and so be marked in the returns of one customhouse as goods imported for interior consumption, and in those of another as Russian wares going abroad. Therefore, although some quantities of

duty-free wares are noted in the number of transit goods, yet a supposition may be made that a part of such wares is not reckoned among transit goods, namely, to some extent, grain and lumber.

Across European Russia in 1891 foreign transit goods followed the courses as below: *a.* from Roumania to Prussia; *b.* from Austria to Prussia; *c.* from Prussia to Prussia; *d.* from Prussia to Austria; *e.* from Prussia to Roumania; *f.* from Austria through Odessa to different foreign countries; *g.* from Roumania through Odessa to different foreign countries; *h.* from different foreign countries through Odessa to Roumania.

*a.* Trough Ungheny to Graevo, Mlava, and Sosnovitsy, various kinds of breadstuff cargoes, as well as fruit and nuts, have been brought, to an amount of 300,000 roubles paper. *b.* From Austria to Prussia, lumber, to the value of 1,100,000 paper roubles, was floated down the river Vistula; through Radzivilov to Graevo and Mlava also, some quantity of lumber has been brought; in the direction from Granitsa to Mlava cargoes of breadstuffs and various kinds of seeds, to the value of about 700,000 roubles paper, were carried by rail. *c.* Lumber to the value of 38,000 roubles was brought along the rivers Pissa, Narev, and Vistula. *d.* Trough Graevo and Mlava to Radzivilov herrings were brought, and through Graevo to Granitsa sacks for grain, which had been previously brought through Granitsa to Graevo, and thence sent on to Prussia without sacks. *e.* Through Graevo to Ungheny herrings were brought. *f.* Trough Volochisk to Odessa 163,000 pounds of lumber destined to go farther east have been brought; the lumber from Galitsia is carried this way chiefly in the winter. *g.* Trough Ungheni to Odessa 438,000 pounds of lumber; *h.* Trough Odessa to Ungheny an inconsiderable quantity of various goods has been carried.

During the same year foreign wares were imported to Finland, as transit goods across Russia, to the value of 89,000 roubles paper, the valuation done in Russia; of these, 200,000 pounds were kitchen salt, brought from the Baltic by the Neva and by the Ladoga Lake; the remainder was carried through Virballen, Sosnovitsy, Granitsa, and Reval to Finland by rail.

Through the Caucasus in 1891 for the Persian Government, transit goods, valued at 44,000 roubles paper, were carried; for the private trade, as has already been mentioned, the transit of goods from west to east is prohibited, and a special license must be obtained in every case.

Asiatic goods to the value of 1,700,000 roubles paper have been brought to Europe; out of which 700,000 pounds in Baku, and 500,000 pounds in Ousun-Ada have been declared as transit wares; among the first prevail: silk, 12,000 pounds, and palm wood, 144,000 pounds; among the latter, wool, 98,000 pounds, and sheepskins (merloushki), 32,000 pieces.

*Transit of Russian wares through foreign countries.*

On the whole, in 1891, the Russian wares, carried as transit goods through the neighbouring countries, may be estimated at 300,000 roubles paper; out of these wares to the value of 148,000 roubles were brought through Austria, to the value of 141,000 roubles paper through Austria and Roumania, and to the value of 35,000

roubles paper through Prussia. The principal article of such trade was sugar, 31,000 pounds, which was carried from Novosselitsy to Ungheny by means of the foreign railways lying close to the Russian frontier. When the line now in construction upon Russian territory leading to Novosselitsy is opened, such transit trade across the neighbouring countries will of course stop. No need will exist also to carry by foreign railways dried plums, of which in 1891 were brought from Novosselitsy: to Radzivilov, 90,000 pounds, to Granitsa 42,000, and to Ungheny, 2,000 pounds. The transit trade through Prussia (13,000 pounds of wheat flour and 18,000 kitchen salt) bears rather the character of a frontier trade, which it is impossible to abolish completely by any measures.

Furthermore, the very peculiar mode of transit of Russian wares through foreign countries by Russian railways and steamboats should be mentioned; namely, the trade of European Russia with Russian Turkestan, in which the goods have necessarily to be carried through Khiva and Bokhara. In 1891 wares to the value of 16 million roubles paper were brought into Russian Turkestan, and wares to the amount of 16,700,000 roubles paper were exported therefrom. To Turkestan there were brought manufactured goods, 689,000; unwrought metals, 175,000; sugar, 130,000; cotton yarn, 91,000; iron and like wares, 74,000; naphtha products, 42,000; glass wares, 18,000; lumber 19,000; trinketry, 7,000 pounds, et cetera.

From Turkestan there were exported: raw cotton, 1,433,000; wheat, 146,000; dried fruit, 126,000; raw hides, 75,000; raw wool, unwashed, 37,000; sheep skins, 23,000 pounds, et cetera. When Khiva and Bokhara will be included in the sphere of the general Russian customs regulations, there will be no need to reckon the above mentioned trade returns in the exterior trade; if the totals of this trade should thereby decrease, however the trade between the separate parts of the Empire will develop in still larger proportions.

#### LARGE COASTING TRADE.

The Russian wares sent from the Russian ports of one sea to such ports of another sea are not imported free of duty, if there were not observed certain custom-house formalities at their loading, as a prevention of free import of foreign goods into Russia. In 1891 the value of Russian goods brought from one sea to the other in the so-called large coasting trade was 18,300,000 roubles paper; namely: from the Baltic to the Black Sea wares were brought to the value of 10,100,000 roubles; from the Black Sea to the Baltic, to that of 5,500,000 roubles; from the White Sea to the Baltic, to 2,300,000 roubles paper; from the Baltic to the White Sea, to 300,000; and from the Black to the White Sea, to 100,000 roubles. Among the wares brought from the Baltic to the Black Sea (from St. Petersburg to Odessa for 6,400,000; from Riga to Odessa for 800,000; and from St. Petersburg to Nikolaev, for 1,600,000 roubles) various kinds of finished goods prevailed, such as, cast-iron wares, 23,000; iron wares, 220,000; steel wares, 106,000; machinery, 38,000; india-rubber wares, 6,500; paper, 57,000; cardboard, 50,000; flax and hemp wares, 10,000; cotton wares, 3,000; stearine candles, 34,000; and matches, 32,000 pounds; besides, this kind of coasting trade included 190,000 pounds of cement, 8,000 pounds of glue, et cetera.

Wares of a quite different kind were carried in the opposite direction, namely, from the Black Sea to the Baltic. In this case the prevailing goods were: raw sugar, 352,000; refined sugar, 45,000; kitchen salt, 3,700,000; tobacco in leaves, 123,000; grape wine in barrels, 40,000 pounds.

From the White Sea to the Baltic, fish were chiefly brought, namely 250,000 pounds, from the coasts of the Mourman to St. Petersburg, and from Archangel to St. Petersburg, 25,000 pounds. From the Baltic to the White Sea an inconsiderable quantity of different wares has been brought, such as, glass wares, cast-iron articles, iron, vegetable oil, refined sugar, cement, apothecary goods, soap, candles, et cetera. To the White Sea were brought from the Black: maize, 34,000 pounds; wheat flour, 15,000; salt, 15,000 pounds, et cetera.

#### SMALL COASTING TRADE.

The free transport of goods from one port to another of the same sea is allowed only to vessels under the Russian flag, the goods being of Russian origin, or such foreign wares on which the import customs duties have been already levied; in 1891 the amount of such goods was: at the White Sea, over 1,700,000 pounds; the Baltic, over 35,000,000; the Black and Azov ports, 119,000,000; and the Caspian, 157,000,000 pounds. With regard to the quantity of the goods transported, the small coasting trade may be compared to the turnover of the exterior trade, because it exceeds the figures of the foreign import, and is but little under those of the foreign export.

The chief interest presented by the small coasting trade is the fact that it aids the centralization of goods for export; it cannot be said, however, that it helps in the same degree the distribution of the wares brought from abroad to the points of consumption. As in the exterior trade the export exceeds the import, so also in the small coasting trade the movement is exclusively in one direction. To characterize the trade movement of the White Sea, it will be enough to mention that from Archangel there were shipped 434,000 pounds of rye flour; in this port 246,000 pounds of fish have been equally received; besides this, 108,000 pounds of salt and 325,000 of lumber, and still smaller quantities of other wares, have been transported.

Out of the total amount of goods transported during 1891 at the Baltic Sea, 12 million pounds have to be excluded as forming the weight of the materials brought from the Pavlovsk port to Libau for the building of a haven there; this cargo is accidental and may not occur in after years. Furthermore, of the remaining 23 million pounds, 6,300,000 fall to wood; 4,500,000, to lumber; 2,300,000, to cement; 1,300,000, to breadstuffs; and 800,000 to wares of cast-iron, iron, and steel. The principal points of arrival of the goods were: St. Petersburg, 7,000,000 pounds; Riga, 5,700,000; Libau, 16,700,000 (among which are the above-mentioned 12 millions pounds); and Reval, 2,400,000 pounds; the cargoes, with regard to the kind of wares, were distributed as follows: to St. Petersburg, wood 1,300,000 pounds and cement 1,100,000 pounds; to Riga, wood 2,900,000, and lumber 900,000 pounds; to Libau, wood 1,100,000 pounds; lumber 1,500,000 and cement 1,000,000 pounds; to Reval, wood 600,000, and lumber 900,000 pounds.



Lumber is carried: from the Pavlovsk port, 1,300,000; from Narva, 1,000,000, and from other places having no customhouses, 5,200,000 pounds. The cement is brought almost in equal quantities from Riga, 1,200,000, and from Port Kunda, 1,100,000 pounds. Besides the Pavlovsk port, the export from which is 13,700,000 pounds, and Riga, 5,400,000 pounds, there are almost no places with a considerable export; the loading is more equally distributed among the large number of the different points of the coast. With the development of the steam navigation on the Black Sea the traffic has already been specialized, and at present it is possible to denote the objects of the coasting trade already quite defined, namely: the transport of breadstuff cargoes to Odessa, the export of coal from Marioupol and Rostov-on-Don, of naphtha products from Batoum, the transport of the Crimean salt, the carrying of lumber and wood to Odessa and Batoum, the export of cement from Novorossisk.

Out of the 38 million pounds of breadstuff cargoes, 19 million or 50 per cent fall to wheat; 7,500,000, or 20 per cent to barley; 4,500,000, 12 per cent to rye, 2,900,000 over 7 per cent to maize; 1,800,000, about 5 per cent, to wheat flour; and 1,300,000 pounds, 3 per cent, to various kinds of gróats. On the whole, 62,600,000 pounds were brought to Odessa in the coasting trade, and 15,500,000 pounds were carried from this port, to which about one-third of the whole turnover of the Black Sea coasting trade thus refers.

Among the imports the principal with regard to quantity were: wheat, 16,600,000 pounds; rye 3,700,000; barley 6,300,000; maize 1,800,000; on the whole, breadstuffs 29,900,000 pounds; kitchen salt, 7,300,000; lumber and wood, 3,800,000; coal 9,500,000; naphtha products 4,800,000 pounds.

The export from Odessa by the coasting trade was: iron 600,000 pounds: cast-iron iron and steel wares, 700,000; coal, 1,300,000; lumber, 1,300,000 pounds.

The breadstuffs are transported on barges towed up the mouths of the rivers (*limany*) Dnieper and Dniester; as may be seen, the return cargoes from Odessa are very inconsiderable. The goods sent from Odessa are chiefly destined to Batoum, and consist mainly of wares of Russian manufacture. The second place in the coasting trade with regard to the turnover is held by Kherson, through which grain and lumber cargoes are carried from the Dnieper to Odessa; the total amount of goods of its coasting trade despatched is 28 million pounds.

The turnover of the Taganrog-Rostov port reaches 17,200,000 pounds; 11,300,000 of export, and 5,900,000 pounds of import. The chief exports were: 6,500,000 pounds of coal; 700,000 pounds of fish; 300,000 pounds of wheat flour; 500,000 pounds of iron, and 400,000 pounds of cast-iron wares and the like. The principal imports were: kitchen salt, 1,200,000 pounds; and fish, 200,000 pounds. The next place with regard to the dimensions of the turnover is held by the Batoum port, the export being 8 million, and the import, 7 million pounds; the principal exports were naphtha products, 6,300,000, and raw cotton, 200,000 pounds; the imports, besides all kinds of finished goods, were: lumber, 2,400,000; wood, 300,000; coal, 400,000; iron, 300,000; cement, 200,000 pounds. Marioupol exports almost exclusively coal, namely 10,600,000 pounds out of the total 12,200,000 pounds. Novorossisk exports 1,200,000 pounds of cement. The greatest part of the coast points are engaged in the salt trade. The exports are from: Eupatoria, 4,500,000; Kerch, 2,500,000; Ochakov, 900,000; Ak-Mechet, 800,000; and from all the other points, 2,500,000 pounds. The imports of

salt are to: Odessa, 7,300,000; Rostov and Taganrog, 1,200,000; Nikolaev, 600,000 pouds; and to other points in smaller quantities.

In the coasting trade of the Caspian two currents may be at present noticed: the transportation of naphtha products from Baku to Astrakhan, and the carrying of Russian manufactured goods in the opposite direction. An active trade is now springing up also between Central Asia on the one side, and European Russia and Caucasus on the other, the junction being Ousoun-Ada. From Baku there were despatched 126 million pouds of naphtha and naphtha products; Astrakhan has received 122 million pouds thereof, out of which 9,400,000 pouds, raw naphtha, 24,900,000 kerosene and 87 million naphtha residues. The latter serve as fuel mainly for the steamers navigating the Volga, as well as for the heating of steam-engines on various factories, and locomotives.

With reference to quantity, grain must be regarded as second in importance among the other wares. In 1891, 3 million pouds thereof have been brought to Astrakhan. Over 1,300,000 pouds of various fish are brought to Astrakhan from different points. The cotton from Ousoun-Ada goes to Astrakhan, about 20 per cent, and to Baku; the Caucasian cotton goes from Baku to Astrakhan.

The final points of destination of the cotton are the factories situated in the Moscow and the Vistula regions, the routes of transport being either through Astrakhan and along the Volga to one of the final points of the net of railways, or through Baku to Batoum and thence by the Black Sea to Sebastopol. When the Petrovsk Railway is opened this latter course will be found more advantageous. Lumber is sent from the Volga to the Caucasian ports, on the whole, to the amount of 6 million pouds; wood is sent from the more southern ports of the same region to Baku.

Astrakhan furnishes the other points, and mainly Baku, with iron, over one million pouds. Nut and palm wood ware sent to Astrakhan, from 30 to 58 thousand pouds. From Astrakhan ice is sent to Baku.



## CHAPTER XXV.

## The Interior Trade and Fairs of Russia.

THE interior trade of a country is in general not easily defined; in fact, no country can boast of having accurate statistics upon the subject. Full data may be still less expected with reference to the land trade of Russia, occupying such a vast territory, exhibiting such variety in the economic life of its different parts, and in which the distances between the centres of production and the markets of consumption are so great. Accordingly, one must be satisfied with the little information characterizing the various sides of its multiform inland trade.

The principal questions arising in the investigation of the interior trade of a country, in answer to which more or less accurate data are desirable, are the following: 1. The object of the trade, that is, the quantity of wares and general values forming the trade of the country; 2. The amount of the trade returns in the interior of the country with regard to the said object, depending wholly on the amount of middling trade operations, which every object undergoes after its production and before its consumption; 3. The summing up of the trade factors or units, that is, trade firms; 4. The traffic of the goods in various directions, and by different ways of communication, according to the conditions of the proposal and sale; 5. Permanent and temporary markets at which the principal turnovers of the land trade are centralized. Then follow the questions about the average prices of the principal products, raw, half-manufactured and finished; about the freights in the land navigation; about the dimensions, kinds and conditions of the loan establishments helping the interior trade, et cetera.

There are almost no data in Russia referring to the first of the above mentioned questions; therefore, only approximate definitions *en masse*, or a simple enumeration, can be given here. The object of the Russian inland trade is formed by all its products with the exclusion of the part consumed by the producers themselves; it comprises all kinds of goods of the manufacturing, mining, and rural industries, gardening, forestry, cattle raising, fishing and hunting. Furthermore, in the turnover of the trade enter also the so-called exchange values (notes and due bills, and money itself, in as much as they are an object of banking

and broker operations. Finally, in that kind of trade are also reckoned the different agencies for the transport of goods and passengers, insurance companies, and the like.

Besides this, it should not be forgotten that all the goods entering into the foreign commerce are necessarily a part of the land trade. In fact, every poud of grain exported must go through many hands in the interior before reaching a foreign market; every article of import likewise forms an object of inland trade before going to the consumer. Of course, the total of the wares exported is included in the amount of the production, but all the wares imported, being brought to the markets as articles for sale, must be reckoned when the object of the land trade is defined.

Of the mass of the above mentioned articles of interior trade, there exist more or less definite data relative only to the manufacturing and mining industries, reckoned in 1890 to 1,656,000,000 roubles paper (Introduction, Volume I); to breadstuffs, oats included, reckoned in the same year to 1,885,000,000 pounds or 1,400,000,000 paper roubles; and to wares of foreign import, which according to the data of the tax collectors, amounted in 1890 to 416,000,000 roubles. The turnover of the railways, with regard to the transportation of freights and passengers, may be fixed according to their gross receipts, as they are chiefly composed of the sums paid for such services. According to the official statistics of the Ministry of Ways of Communication, the gross receipts of the whole net of Russian railways, Finland excluded, in 1890 were 284,500,000 roubles. The turnover of the steam navigation and other transport agencies may be fixed, according to the data of the Department of Trade and Manufactures («Statistical Results of the Rates and Assessed Taxes for the year 1889»), approximately at 239,000,000 roubles. Thus, the general sum for the transportation of goods and passengers amounts to 523 million roubles. The valuation of the turnovers of various insurance companies, as well as that of paper values and money forming the object of bank speculations, cannot be made, as no data thereon exist.

Thus, for the fixing of the object of the interior trade in Russia, there are only the following figures, reckoned approximately:

|   |                        |
|---|------------------------|
| Product of manufacturing and mining industries                  | 1,656,000,000 roubles. |
| Breadstuffs . . . . .   | 1,400,000,000 >        |
| Foreign imports . . . . .                                       | 416,000,000 >          |
| Turnover for the transport of goods and<br>passengers . . . . . | 523,000,000 >          |
| Total . . . . .   | 3,995,000,000 roubles. |

If the values of the products and turnover of other trade firms, as well as those of values and money forming the object of banking operations be added to this total, it will certainly greatly exceed the sum of the 4,000,000,000 given above.

With regard to the number of trade firms or commercial undertakings, and to the amount of their turnovers, there exists various and full information, owing to the statistical work of the Department of Trade and Manufactures referring to commercial and industrial enterprises. These works began with the establishment in 1885

of additional taxes: the income tax on joint-stock and share companies, the assessed tax on personal enterprises; the latter spread only since 1889 on all kinds of personal commercial enterprise, guild and non-guild, with the exclusion only of the very small huckstering and petty trades. The «Statistical Results of the Rates and assessed Taxes for the year 1889» includes all the guild and non-guild commercial undertakings, with the above-mentioned exceptions, as well as all joint-stock and share companies, with the exclusion of railway and mutual insurance companies; and it enumerates them by separate governments and districts, classifying them according to the different branches of trade, and fixing approximately the turnovers and profits of each of these branches, thus presenting a somewhat complete trade monograph of each government and district.

According to the data furnished by this work, the average number of guild commercial enterprises paying assessed taxes in 1889, was 129,411, and their total turnover 6,828 million, or 52,762 roubles of turnover per firm. The average number of the non-guild commercial undertakings paying assessed taxes was 230,540, and their turnover reached 516 million roubles, or 2,238 roubles per business firm. On the whole there were of guild and non-guild enterprises 359,951; and with the 23,000 freed this year from the assessed taxes, 383,000, with a turnover of 7,344 million roubles.

In reference to the 740 joint-stock and share companies, and companies based on mutual responsibility, the statistics of the Department of Trade and Manufacture give only their profit and not their turnover, which may be approximately calculated according to the amount of the profits. Taking as a standard that all the banking and general loan establishments belonging to the above-mentioned companies yield  $\frac{1}{3}$  per cent of profit on the turnover, and that all the remaining companies, that is, insurance companies, forwarding agencies and other like companies, yield on the average 2 per cent of profit, it will result that the profits of the 563 banking and loan establishments are 30,680,000 and their approximate turnover 6,136,000,000 roubles\*; and the profits of the remaining 177 firms, 11,430,000 roubles, their turnover being 575,000,000 roubles; thus, the total amount of business will be 6,711,000,000 roubles.

In this way, when the commercial undertakings and their turnovers are reckoned, the results will prove as follows:

|  | Number of under-<br>takings. | Annual turn-<br>over.   |
|--|------------------------------|-------------------------|
| Personal guild and non-guild<br>enterprises . . . . .                            | 383,000                      | 7,344,000,000           |
| Joint-stock companies, and<br>those based on mutual re-<br>sponsibility. . . . . | 740                          | 6,711,000,000           |
| Total .  | 383,740                      | 14,055,000,000 roubles. |

\* The State Bank, the State Bank of the Nobility and the Peasant banks, as well as other State loan establishments, are not reckoned herein. The figures showing the turnover of the joint-stock and loan establishments, as given here, are considerably lower than those given in the account books of some of the large Russian banking firms.

The commercial companies, with regard to their number, and especially to their turnovers, are very unequally distributed among separate governments. Those of St. Petersburg and Moscow, as well as those in which manufacturing is more-developed, have the precedence, as may be seen from the accompanying table comprising the most active governments in respect to trade.

| GOVERNMENTS.             | NUMBER OF COMPANIES (SHARE, GUILD AND NON-GUILD). | ANNUAL BUSINESS, IN ROUBLES. |
|--------------------------|---|------------------------------|
| St. Petersburg . . . . . | 18,857  | 4,647,000,000                |
| Moscow . . . . .         | 19,086  | 2,969,000,000                |
| Kherson . . . . .        | 10,918  | 1,447,000,000                |
| Lithuania. . . . .       | 6,693   | 545,000,000                  |
| Warsaw . . . . .         | 9,912   | 542,000,000                  |
| Kharkov . . . . .        | 7,325   | 408,000,000                  |
| Kiev. . . . .            | 11,897  | 406,000,000                  |

The distribution of the firms and of their turnovers shows no less variety with regard to the different branches of trade to which they belong. The more prominent of these branches, according to the number of the firms and the amount of their business, are the following.

| BUSINESS FIRMS:   | NUMBER OF FIRMS (JOINT-STOCK, GUILD AND NON-GUILD). | ANNUAL BUSINESS, IN ROUBLES. |
|---|---|------------------------------|
| Loan, banking, and commission establishments.                 | 3,388   | 10,166,000,000               |
| Trade in manufactured goods. . . . .                          | 37,450  | 637,000,000                  |
| Trade in grain and flour. . . . .                             | 16,681  | 481,000,000                  |
| Hotels, restaurants, buffets, drinking halls, inns.           | 103,080   | 263,000,000                  |
| Transport agencies, railways excluded. . . .                  | 2,259   | 239,000,000                  |
| Wine stores, wine cellars. . . . .                            | 19,245  | 211,000,000                  |
| Trade in metallic wares and machinery . . .                   | 7,585   | 144,000,000                  |
| Lumber trade. . . . .   | 5,839   | 108,000,000                  |
| Trade in ready-made clothes, hats, and fur articles . . . . . | 5,662   | 102,000,000                  |

As regards the movement of goods according to the conditions of demand and sale, the data thereon are to be found in the yearly statistics of the Ministry of Ways of Communication. The information upon the subject, especially in reference to the railway activity, are given in these works somewhat fully, although they do

not always answer the problems of the trade and industry statistics. Persons interested in the matter are referred to the said works.

Finally, as to the markets on which the business of the land trade is centred, it should be mentioned that, with regard to the permanent markets, their turnovers, and the stores of different wares stocked thereon, there are but few and fragmentary data, showing only the storage of the goods prepared for export at the ports; and that of grain cargoes on the main wharfs, chiefly on the Volga basin during the close of navigation. About the temporary markets, that is to say, fairs, there exist more various and complete data; and as the trade at fairs is one of the characteristics of the Russian inland trade, this subject will be treated here separately.

### THE FAIRS.

While fairs have lost almost every importance in Western Europe with very few exceptions, they still hold a prominent position in the interior trade of Russia. It is, however, very difficult to state their general turnover. At the end of the seventies a trial was made to fix the amount of the trade at the fairs, and the result showed that there were in all 2,825 fairs; their turnover, with the exclusion of the 110 of which no data existed, amounted to 577 million roubles of wares brought thereto, and to 377 million roubles of wares sold thereat, the number of tradesmen engaged in the business reaching 194,000. Of course these data cannot be looked upon as perfectly correct, but they give an approximate idea of the quantity of goods in traffic at the fairs.

Of the total number of fairs the greatest part, 82 per cent, bear the character of village fairs (bazaars); their chief business consists in the sale of various rural produce to the dealers by the peasants, and in the buying in return of the necessary stores and various articles needed in rural economy. The distribution of the fairs in the different regions of Russia is very unequal. The greatest number of the larger fairs falls to Little Russia and the Eastern region (governments of Kharkov, Poltava, Perm); the smallest number falls to the western region, where towns are more numerous.

Most of the fairs were established in far distant times; thus, for example, at the conflux of the rivers Mologa and Volga in the sixteenth century a fair of considerable importance existed, the traffic continuing for four months and bearing mainly the character of an exchange trade. Germans, Poles, Lithuanians, Greeks, Italians and Persians frequented this fair. The tradesmen exchanged ready-made clothes, tissues, leather, axes and crockery, for raw materials, and especially for honey. In the seventeenth century this fair ceased to exist. In the vicinity of Little Russia, during the seventeenth and eighteenth centuries, flourished the Svensk fair near Briansk, and the Korennaïa, near Kursk. Moreover, some of the now existing fairs of Little Russia operated with success even before the annexation of that country to Russia. The fair of Irbit was established in 1643, that of Nizhni-Novgorod only in 1817; before that time this fair was held in Makariev, and still earlier in Vassil-Sursk, where it had been established already during the reign of the Prince (Veliki Kniaz) Vassili Ioannovich. New and large fairs have not been founded of late; only

in 1886 a fair was opened at Baku; some new fairs have been also established in Siberia, and in the Russian Central Asiatic possessions.

The firm establishment of a trade held at fairs in Russia was mainly due to the lack of convenient ways of communication hindering the local dealers from buying the necessary wares at the points of their production, or in places where stores of the kind existed, as well as to the sparsity of the population, the feeble development of the loan system, and lack of capital. It should be also mentioned that the freezing of the water ways during the winter aided more the temporary than the permanent trade. All these circumstances incited the tradesmen to meet half-way at definite dates in order to exchange their goods, regulate their accounts, and strike new bargains. In general, the fairs afford an exclusive opportunity for the small dealers and hucksters to buy the necessary goods immediately from the manufacturers or large wholesale dealers without middlemen, and in the mean time the manufacturers have the opportunity to enter into close mercantile relations with the tradesmen and be better acquainted with the demands of the market.

The fair trade in Russia was also greatly helped by the protection evinced from long ago, by the Government with regard to it. Although formerly, in the seventeenth century, the trade of the fairs was not free from taxes, such as the toll, *tamga*, and others, yet owing to the interest taken in the establishment of fairs by monasteries they always enjoyed some franchises and protection. Moreover, the Government itself, previous even to the reign of Peter the Great, instituted fairs with the view of drawing thereto the trade of the neighbouring countries. Peter the Great also paid great attention to the fairs. In the Statute issued in 1721 the Chief Magistrate is enjoined to multiply fairs in towns and districts, «in convenient places, especially in such as possess water ways of communication», because these fairs serve to increase the fisc, to develop the trade and manufactures, and thereby promote the welfare of the people.

In 1753 all the inland customs duties were abolished, but as it referred to the trade in general no special advantage resulted therefrom to the fairs. In the reign of Catherine the Second, in 1775, a percentage tax on the capitals declared by the tradesmen «upon their honour» was installed, and the tradesmen of the two first guilds, by paying a certain per cent on their capital, received the right to trade over all Russia, including the fairs. However, the merchants of the third guild and burghers, having only the right to traffic in their boroughs, could not carry on the trade at fairs lying without the boundaries of the district, without paying a special tax for the privilege. Therefore, the number of merchants having no right to trade at the fairs duty free was considerable, and increased still more in 1812, when the same rules were applied to the peasants who carried on their trade according to special licenses of three categories, corresponding to the three guilds.

This state of affairs called forth complaints against the regulations laying a restraint on the commerce at the fairs, and the Government finding that such a restraint could totally ruin them, and thereby cause a considerable decrease in the revenues, as the shops belonging to the treasury might remain untenanted, resolved in 1814 to proclaim trade at all the fairs of the Empire free to all. By this law, the fair-trade was placed in a most favourable position, all the more so as until 1863 inhabitants of towns were not allowed to open shops in villages, where therefore very



few permanent shops containing necessary wares existed, because in the shops opened by peasants only a few articles were allowed to be sold. This abnormal state of affairs was changed in 1863 by the regulation allowing village shops to be opened by all kinds of dealers. This measure in no way damaged the trade at the fairs, which continued to attract numbers of merchants and local inhabitants, as the latter found more buyers for their products and the former had a greater choice in the making of their stocks. The fairs aided greatly the development of the trade in Russia, which did not possess at the time either a sufficiently large network of railways and telegraphs, or enough banking establishments. Thus, in the middle of the present century the fairs of Little Russia reached their highest development. Meanwhile the character of the fairs begins to change visibly, owing to the considerable development of the manufacturing industry in Russia.

Until the twenties, that is, until the issue of the tariff of 1822, considerable quantities of foreign manufactured goods were brought to the Russian fairs. Towards the end of the twenties and at the beginning of the thirties, however, Russian manufactured goods began to prevail at the fairs, where stores were organized by the manufacturers themselves. These goods enjoyed the largest sale at the fairs of Little Russia. As a consequence, such fairs and towns as were mainly dealing in foreign wares, as Niezhin, Krolevets, lost their importance; on the contrary, those nearly connected to Moscow began to gain in importance, for instance the fair of Kharkov.

However, the trade at fairs suffered many inconveniences. Those of Little Russia, as is known, bear the character of an ambulant market. In fact there exists a whole cycle of fairs following consecutively one after the other in the course of the year, at Kharkov, Poltava, Romny et cetera; therefore the wares must be carried from one fair to the other, unpacked and re-packed. According to the calculation of J. Aksakov («Fairs of Little Russia») some of the tradesmen had to do this over 20 times a year, and the goods were carried 2,400 versts on the average. Likewise many of the wares are carried from the fair of Nizhni-Novgorod to that of Irbit, thence to Ishym, Biisk, and back again. It is remarkable that notwithstanding the freight rates the prices of the goods at the remotest fairs differ very little from those at Moscow. This was chiefly due to the fact that, in selling their goods at all the fairs, the manufacturers and wholesale dealers set the prices on the articles not reckoning the expenses incurred by the transport of the goods to a certain fair but on considering the yearly turnover, covering the losses undergone at one fair by the profits of another. Of course, this was not a normal condition, and the permanent trade could not afford to compete with it, based as it was on more regular calculations. Besides, owing to the franchise granted to the fair-trade, a class of special dealers was formed, carrying on their trade by sending their goods only for the time of the free trade at the fairs in certain localities. All these circumstances impeded greatly the organization of a more regular trade on permanent markets, and lead to the conclusion that the privileged condition of the fairs finds no longer an excuse for its existence, all the more so, as with the construction of a large railway network, the establishment of telegraphs, banks, and forwarding agencies, the regular tradesmen have the possibility of getting their stock of goods immediately from the places of their manufacture.

In view of this, in 1882 a law was issued, according to which all the fairs

lasting more than 7 days, that is, bearing a purely commercial character, were subjected to a special ticket tax. Moreover, the fairs were divided into five categories. To the first the fair of Nizhni-Novgorod was referred, the tax being 100 roubles per ticket of first guild, 25 roubles for one of second guild, and 6 roubles a ticket for hucksters. To the second category, fairs with a duration of over 21 days were referred; to the third, fairs lasting from 15 to 20 days; to the fourth category, fairs of 8 to 14 days duration; and lastly to the fifth category, fairs not exceeding 7 days duration. The fair dues were determined in accordance with this classification. The fairs belonging to the fifth category were not subject to any taxation. Besides this, special trading licenses of two classes were instituted.

According to the most recent data, for 1889, the total number of fairs in Russia included one fair of the first category, the Nizhni-Novgorod, 47 of the second category, 59 of the third category, 291 of the fourth category, or altogether 398 different fairs. The fifth category included all the remaining fairs, to the number of 2,500. The total governmental revenue, brought in by the fair dues, reaches an average of 332,000 roubles. Since 1884 this revenue has not undergone any essential variation, although that brought in by the frontier fairs has somewhat decreased. In the meanwhile the revenue given by the trade dues has considerably increased. This fact partly shows that the settled form of trade has begun to develop at the expense of the trade at fairs. An examination of the trade done at the different fairs will now be considered.

The Nizhni-Novgorod fair lasts from the 15th of July to the 25th of August for wholesale trade, and to the 10th of September for retail trade. In the extent of its business this fair undoubtedly occupies the first place, not only among the Russian fairs, but also among those of the whole world. Strictly speaking, it was transferred to Nizhni-Novgorod in 1816, but its foundation dates very far back. Even during the existence of the kingdom of Kazan, the Russian merchants went to Kazan to trade at the market on the Arsk plain. Owing to the putting to death of Russian merchants at one of these fairs, the Grand Duke Vassili Ivanovich, forbade the Moscow merchants to trade at Kazan, and in 1524 instituted a special fair at the extreme boundary point of the kingdom of Moscow, at Vasillsoursk on the Volga, thinking that in this manner he could attract the trade which proceeded on the Arsk plain. But apparently this endeavour had no great success, and it was not until the beginning of the following century that a new fair began to flourish at Makariev, 80 versts below Nizhni-Novgorod. This fair was established with the most active participation of the Makariev Zheltovodsk monastery, at whose expense the various buildings were erected, and in general it may be said that in Russia the majority of the fairs were erected in the neighbourhood of monasteries. The fair continued to be held at Makariev until 1816, when after the fire it was transferred to Nizhni-Novgorod; and this is why the Nizhni-Novgorod is now known in Russia as the Makariev fair.

The geographical position of Nizhni-Novgorod was extremely favourable to the further development of this market. Situated at the junction of the Volga and Oka, it possessed an extremely convenient means of communication with the greater part of Russia. The upper course of the Volga passes through the central industrial region of Russia, which plays so important a part in the trade of the

Nizhni-Novgorod fair, and the system of water ways extends further right up to St. Petersburg, which is the chief consumer of the grain cargoes of the Volga. The middle course of the Volga and Kama give Nizhni-Novgorod the possibility of communicating with the Urals, which furnish the greater part of Russia with its metals, and also with Siberia, while the lower Volga and Caspian Sea connect it with Astrakhan, the Caucasus, Central Asia, and Persia.

The Oka flows along the southern boundary of the industrial zone, and along the northern borders of the corn-producing governments, and has thus long formed a link between Nizhni-Novgorod and one of the richest regions of Russia; and lastly, it is united with Moscow by a railway. There is not the least doubt that no other point could be found in the east of Russia, which in its geographical position could equal Nizhni-Novgorod for the purpose of a large trade. This explains how the Nizhni-Novgorod fair has attained, and continues to hold such a unique position in the interior trade of Russia. The range of business done by the Nizhni-Novgorod fair embraces nearly the whole of Russia. Only the south and west have no direct relations with this fair. The central industrial governments send their manufactured goods to the fair; the Urals, their metals; Siberia dispatches furs, skins, wax, oil, tallow; the Kama, salt; the Lower Volga, fish; the Caucasus, naphtha products and wine; Central Asia, cotton and lamb skins; Persia, fruits; China, tea; the south-western region, sugar; Little Russia, tobacco; the middle Volga governments, corn, timber and certain other goods; and Western Europe, manufactured and colonial goods, and also wine. A vast number of people congregate at the fair; on the average there are about 200,000 visitors.

Although in general the Nizhni-Novgorod fair has the usual Asiatic colouring yet in reality the Russian element predominates, and the Asiatics form a comparatively small percentage. The chief operations of the fair consist in the sale of manufactured goods to the merchants from the towns, who then distribute them over the whole of Russia. Moreover, the sale is chiefly carried on at first hand by the actual manufacturers. In this manner the fair supplies the great part of Russia with the chief articles of its consumption for the whole year. However, in recent years, owing to the growth of the Russian railway system, many of the merchants in the towns are in direct communication with Moscow, and the importance of the Nizhni fair in this respect has somewhat fallen. The Asiatics chiefly take manufactured goods in exchange for their wares, although they sometimes prefer to make the exchange in coin. Many raw materials are even dealt with at the fair, and these operations are participated in by foreigners. The greater part of the dealings at the fair are done on credit, and the bills are issued for 6, 9 and 12 months, or even longer terms, and frequently coincide with the periods of the Irbitzk fairs. A very active retail trade is also done at the fair. In general it would be impossible to mention any dealings which are not carried on here, beginning from the largest and ending with the most insignificant retail trade. The fair acquires a still greater importance owing to the fact that its greatest activity corresponds to that moment when the state of the harvest is known, and upon which all the further economy of Russia depends. So also the result of the business for the expiring year is ultimately decided at the fair. Thus the dealings at the fair influence the whole further progress of trade in Russia.

Although the statistical data of the trade done at the fair are not in general quite trustworthy, still they are not void of interest, as they give an idea of the development of this trade and of the relative importance of one or another of its branches. The trade turnover of the Nizhni-Novgorod fair may be represented as follows:

|            |                     |            |                     |      |                     |
|------------|---------------------|------------|---------------------|------|---------------------|
| 1817--1826 | 32 million roubles  | 1847--1856 | 60 million roubles  |      |                     |
| 1827--1836 | 35   »   »          | 1857--1866 | 104   »   »         |      |                     |
| 1837--1846 | 48   »   »          | 1867--1876 | 155   »   »         |      |                     |
| 1877       | 145 million roubles | 1882       | 223 million roubles | 1887 | 193 million roubles |
| 1878       | 141   »   »         | 1883       | 201   »   »         | 1888 | 190   »   »         |
| 1879       | 180   »   »         | 1884       | 206   »   »         | 1889 | 186   »   »         |
| 1880       | 200   »   »         | 1885       | 186   »   »         | 1890 | 181   »   »         |
| 1881       | 246   »   »         | 1886       | 183   »   »         | 1891 | 168   »   »         |

In the first year of its transfer to Nizhni, in 1817, the turnover of the fair reached 25 million roubles. If the figures for each period of ten years be examined, it will be found that the value of the goods brought to the fair increased from 32 million roubles in the first period to 155 million roubles in the sixth period, 1867 to 1876; then, after somewhat falling in 1877 and 1878, it again rose in 1879; and in 1881 reached its highest point of 246 million roubles; subsequently it again gradually fell with some inconsiderable fluctuations, and in 1891 it was only 168 million roubles. Naturally the institution of the fair dues in 1882 had a certain effect upon the trade of the fair, but the chief cause of the fall in its business is to be found in the construction of the new railways in the eastern portion of Russia, and of the Transcaspien line, which gave a possibility of carrying on relations with Central Asia almost throughout the year. It is worthy of remark, the general turnover of the fair does not in general vary much in one direction or another. This is due to the fact that, with the vast region covered by the trade of the fair, it cannot happen that all the localities should simultaneously be in favourable or especially unfavourable conditions of harvest. Thus, even in 1891, when the harvest was unprecedentedly bad in Russia, the turnover of the fair fell comparatively little, thanks to the advantageous conditions of trade in Siberia, the Caucasus, and the Don.

The first place at the Nizhni Fair is occupied by cotton goods, as seen in the Table on the next page. In 1890 to 1891 their average value was 25 million roubles, which was exactly that for the period 1868 to 1872, and now forms about 14 per cent of the total value of the goods brought to the fair. The goods are chiefly supplied from Moscow, Ivanovo-Voznesensk, and St. Petersburg, and in a smaller quantity from Lodz. The business done in other articles depends to a considerable extent upon the more or less favourable sale of cotton goods. The Volga governments, Caucasus, Don, Siberia, Central Asia and Persia are generally the chief buyers of this class of goods. As the value of cotton goods brought to the fair has not in any way increased since the period, 1868 to 1872, although the Russian production of such goods has made considerable progress, it is impossible not to conclude that the cotton trade at the Nizhni fair has undergone some variation, and it must be attributed to the fact that, with

the development of the railway communication, many parts of Russia have been brought into direct relations with the centres of production.

In passing to an examination of the present position of the trade of the Nizhni-Novgorod fair, as regards the different species of goods, the following table including for the sake of comparison the figures for the five-years period, 1868 to 1872, which may be regarded as normal for the internal trade of Russia is introduced.

|  | AVERAGE VALUE OF GOODS BROUGHT TO THE FAIR. |             |
|--|---|-------------|
|  | 1868—1872.                                  | 1890—1891.  |
|  | Roubles.                                    | Roubles.    |
| Cotton and calico goods . . . . .  | 25,000,000                                  | 25,000,000  |
| Wool and woollen goods . . . . .   | 17,000,000                                  | 15,000,000  |
| Linen and flax goods . . . . .   | 3,500,000                                   | 4,200,000   |
| Silk and cotton-silk goods . . . . .   | 7,000,000                                   | 5,500,000   |
| Furs . . . . .   | 7,000,000                                   | 8,500,000   |
| Skins and leather goods . . . . .  | 5,500,000                                   | 7,500,000   |
| Metals and metallic articles . . . . .   | 10,000,000                                  | 22,000,000  |
| Fish goods . . . . .   | 4,000,000                                   | 5,300,000   |
| Sugar . . . . .  | 3,700,000                                   | 2,800,000   |
| Tea . . . . .  | 8,400,000                                   | 14,600,000  |
| Foreign manufactured goods . . . . .   | 3,400,000                                   | } 2,400,000 |
| » wines . . . . .  | 2,100,000                                   |             |
| Russian goods in general . . . . .   | 123,000,000                                 | 144,000,000 |
| Bokharian and Khiva goods . . . . .  | 3,000,000                                   | 6,000,000   |
| Persian goods . . . . .  | 3,100,000                                   | 2,500,000   |
| Chinese goods . . . . .  | 8,400,000                                   | 14,700,000  |
| Western European and colonial goods, dyes, pigments and medicinal preparations . . | 20,000,000                                  | 7,300,000   |
| Total amount on sale . . . . .   | 149,000,000                                 | 174,500,000 |
| »   »    sold . . . . .  | 130,000,000                                 | 166,000,000 |

Woollen goods were brought to that fair, to the value of 15 million roubles, in 1890 to 1891, and to 17 million roubles in 1868 to 1872. A certain although small amount of these woollen goods go to Kiakhta in exchange for Chinese stuffs. There is a somewhat considerable amount, from 500 to 600 thousand pounds of wool, brought to the fair, a large proportion of which is bought for foreign markets, including America.

With respect to other classes of goods, the increase in the amount of furs and hides may be partly ascribed to the increased demand abroad. Then, the increase in the trade in metals and metallic goods is explained by the increased demand for these goods in the interior of Russia, and by the growth of the production of the Ural works in recent years. So also, the amount of tea brought to the fair has also

increased, owing to the constant growth of the demand in Russia. The tea is brought to the fair, both by land through Kiakhta, and by sea through Odessa. In former times, until the beginning of the sixties when tea was not transported by sea, the tea trade of the Nizhni-Novgorod fair was of far greater importance, and almost the entire subsequent course of the business of the fair depended upon the fall of the tea trade. Now this trade has ceased to play the prominent part it formerly did, because over three-fourths of the tea does not pass through the fair.

In recent years certain new classes of goods have made their appearance at the fair, which in former times played quite a secondary part, as for instance Caucasian wine, kerosene, naphtha refuse. But at the same time Caucasian madder, which in the fifties and sixties played an important part among dyes, has now almost disappeared from the market. This trade has now entirely ceased in the Caucasus, owing to the competition of the naphtha dyes. A great falling off is also observable in the foreign goods, and especially of wines, which are every year receding more and more before the Russian wines. The increased trade in Bokharian and Khiva goods may be partly ascribed to the increased importation of cotton, which however now chiefly goes direct to Moscow and Lodz without passing through the fair. But the chief reason for the increased trade with these two countries, is the increased importation of lamb skins, wool, and certain other Central Asian goods. The trade done in Persian goods at the fair has somewhat decreased, but it must not be concluded from this that the Russian trade with Persia has fallen; on the contrary, since the closing of the Transcaucasian transit, the Russian relations with Persia have grown considerably, especially in respect to sale.

*The Irbit fair* is held at Irbit in the government of Perm, between the 1st February and the 1st March. Notwithstanding the fact that Irbit is situated outside the chief trading route between Russia and Siberia, the Irbit fair has acquired a prominent position in the Russian trade. It is here that Siberia supplies itself with cotton and other goods for the whole year, and this fair forms the centre for the chief Siberian goods, such as furs, skins, fish, bristles, horse hair, honey, wax, butter, hemp seed and linseed, and for Chinese and Asiatic goods, such as tea, silks, camels hair, et cetera. Many goods are sent here direct from the Nizhni-Novgorod fair, and remain unpacked, in which form they are also sold. Many of the Siberian goods are sent to Nizhni in the same shape. The price of the Russian goods, which are chiefly from Moscow, is calculated plus the cost of transport, but very often a certain deduction is made.

The Irbit fair was founded in 1643. Up to the twenties of the present century its trade did not exceed two million roubles. At the end of the thirties it reached 10 million roubles, and from that time, it began to grow rapidly. In 1863 it amounted to 50 millions. In the following years it fluctuated between 40 and 50 million roubles, and in recent years was as follows:

|      |         |    |                 |
|------|---------|----|-----------------|
| 1887 | . . . . | 56 | million roubles |
| 1888 | . . . . | 57 | » »             |
| 1889 | . . . . | 49 | » »             |
| 1890 | . . . . | 46 | » »             |
| 1891 | . . . . | 45 | » »             |
| 1892 | . . . . | 34 | » »             |

The number of visitors to the fair amounts to 100,000 persons; hence it will readily be understood what an animation this fair gives to the town of Irbit, whose fixed population does not exceed 5,000. Many of the houses remain closed during the year, and are only opened during the season. Large dealings are made at the fair for the delivery of Siberian grain and other goods to the north-eastern governments of Russia. Many of the goods are left at Irbit until the opening of the navigation permits their being transported by water. The closing of the Irbit fair depends upon the fur trade; if this business is not favourable the furs are dispatched to Moscow. In recent years the fair of Irbit has somewhat declined, as a portion of its trade has passed over to Tumen, which has the advantages of being the centre of the steam river communication, and of avoiding the transport of the goods to Irbit, and back. Besides this, the construction of the Siberian Railway will also reflect unfavourably upon the Irbit fair, as the Siberian merchants will find it more profitable to secure their goods according to their requirements at any time of year, than to supply themselves for the whole year as is now done.

The trade done in different classes of goods is as follows.

| G O O D S.              | AVERAGE FOR<br>1868-1872. | AVERAGE FOR<br>1890 *. |
|-------------------------|---------------------------|------------------------|
|                         | R o u b l e s .           |                        |
| Cotton goods . . . . .  | 11,000,000                | 15,000,000             |
| Woollen goods . . . . . | 3,300,000                 | 3,100,000              |
| Sundries . . . . .      | 2,100,000                 | 3,600,000              |
| Furs . . . . .          | 3,300,000                 | 2,300,000              |
| Tea . . . . .           | 2,100,000                 | 5,200,00               |

Foreign goods are brought to the fair to the value of 500,000 roubles, including chiefly, cotton, woollen, and silken goods, wood oil, indigo and dry goods. The chief Siberian goods dealt in by foreign merchants are furs.

The chief fairs of Eastern Russia, besides these, are the Sbornaya, Menzelinak, and Ivanovsk fairs.

The *Sbornaya* fair is held at Simbirsk during the first and second week of Lent. Its trade in 1868 to 1872 amounted to 6,600,000 roubles, and in 1891, to 6,500,000 roubles. In former times this fair supplied the governments of Orenburg, Ufa and Samara. But now, since the construction of railways, its region has contracted; but it is still kept up, owing to the absence of railway communication in the surrounding districts. The chief object of trade here, as at other fairs, is cotton stuffs. This fair has also an important influence upon the ensuing grain trade, after the opening of the navigation upon the Volga; as among other things the prices of grain and rates of freight are decided at this fair.

The Menzelinsk fair is held at Menzelinsk in the government of Ufa, from the

\* 1890 is chosen for comparison as being more normal.

26th of December to the 11th of January. In 1868 to 1872 its trade amounted to 6,300,000 roubles, and in 1890 to 1891 to 4,600,000 roubles. In general this fair is losing its importance owing to the extension of the railways to Zlatoust. Besides cotton goods, a considerable quantity of skins are sold at this fair.

The Ivanovsk or Krestovsk fair is held in the village of Masliansk, in the Shadrinsk district of the government of Perm, during the month of August. The value of the goods brought to the fair in 1868 to 1872 was 5,600,000 roubles, and in 1890 to 1891, 5,800,000 roubles. The chief objects traded in are the same as at the Menzellinsk fair. Besides, owing to the proximity of the Tartars and Kirghiz, certain Central Asian goods are brought to this fair.

Among the Siberian fairs the following should also be mentioned. The Winter-Nikolsk fair at Ischim, which is held from the 1st to the 25th of December. Goods to the value of 4,600,000 roubles were brought to this fair in 1891. The Konstantinovsk fair, held at Akmolinsk at the end of May and beginning of June. The Petrovsk fair at the station of Athasarsk in the Akmolinsk province. The Tainchikoulsk fair held in the district of Petrovsk in the Akmolinsk province. These fairs owe the chief importance to their cattle trade. The cattle are brought from the neighbouring provinces and from the Central Asian Khanates. Besides which, a somewhat large amount of Bokharian goods are brought from Central Asia, for sale to the Kirghiz. The trade done at the Troitsk and Orenburg bartering yards is of the same character. The goods brought to the first named have a value of 3,600,000 roubles.

The chief fair of the Transbaikal province is that of Verkhneoudinsk. The value of the goods brought to this fair in 1891 amounted to 1,080,000 roubles. The chief fairs in the province of Irkutsk are the Rozhdestvensk and Nikolsk; in the province of Yakutsk, the Yakutsk fair, which is held from the 10th of June to the 1st of August. The value of the goods brought to this fair amounts to 1,300,000 roubles. Besides these there are several other fairs, whose trade exceeds one million roubles, both in eastern Russia and Siberia.

A large number of fairs are held in the governments of Saratov, Samara, Tambov and Voronezh, and although their accumulated trade is of considerable dimensions, still none of them are particularly large. In May a spring fair is held in the government of Astrakhan at the Akhounsk farm of the Interior Khirgiz horde. This fair does a large cattle trade, amounting to 2,600,000 roubles.

In northern Russia the only fair worthy of mention is the Margaritinsk fair held at Archangel in September. The chief objects of trade, besides manufactured goods, are fish and furs, skins, and the like. The value of the goods brought to the fair in 1890 reached 726,000 roubles.

In the central industrial governments there are not any large fairs. The most prominent is the Rostovsk fair held at Yaroslav. The value of the goods brought to this fair in 1890 was about 600,000 roubles. There are also no large fairs held in the western region and in Poland. The only one worth mentioning is the Lenchna fair in the government of Lublinsk. The value of goods brought to this fair amounts to one million roubles, the greater part of the trade being done in live stock.

The Ukraine fairs have long flourished in Little Russia. Before the union of this region to Russia, a whole series of fairs used to be held at Krolevets, Romny and Nezhin, where the Great Russian, Polish and Little Russian merchants, and even



Greeks, Volokhi and Germans from Gdansk, used to trade. Some of these fairs have continued in existence to the present day. When the Novorossisk region was joined to Russia, the fairs moved towards the South, in consequence of which certain of the former began to decline, and new ones to come into existence, in localities further to the south, as at Kharkov and Poltava. The firm establishment of these fairs was not a little assisted by the development of the Russian manufacturing industry, whose products little by little supplanted foreign goods, which were formerly imported overland. The chief fairs of the Ukraine are as follows:

| LOCALITY OF FAIR. | NAME AND TERMS.  | BUSINESS DONE, IN ROUBLES. |            |
|-------------------|--|----------------------------|------------|
|                   |  | 1868—72.                   | 1891 *     |
| Kharkov . .       | Kreschensk from Jan. 6th to Feb. 1st . . . . .                               | 8,500,000                  | 1,500,000  |
| Romny . .         | Masliansk > Feb. 10th to March 1st. . . . .                                  | 3,000,000                  | 2,500,000  |
| Romny . .         | Voznesensk > 4th Wednesday after Easter to ten days after Ascension. . . . . | 2,200,000                  | 1,700,000  |
| Kharkov . .       | Troitsk > June 1st to June 10th. . . . .                                     | 2,900,000                  | 9,000,000  |
| Poltava . .       | Ilinsk > July 16th to the beginning of August. . . . .                       | 1,500,000                  | 2,800,000  |
| Kharkov . .       | Ouspensk > August 15th to Sept. 1st . . . . .                                | 2,500,000                  | 8,000,000  |
| Romny . .         | Alexandrovsk > August 30th to Sept. 13th. . . . .                            | 3,600,000                  | 1,300,000  |
| Kharkov . .       | Pokrovsk > October 1st to Nov. 1st. . . . .                                  | 5,300,000                  | 10,000,000 |
| Romny . .         | Michailovsk > October 8th to Nov. 15th . . . . .                             | —                          | 2,200,000  |

All these fairs, following one after another through the entire year, are closely connected, and the goods which remain unsold are frequently passed on to the following fair, and even the payments are also passed from one fair to another. At the present time, however, perpetual stores have been erected at Kharkov and Poltava, and the former character of these fairs has somewhat changed. The chief business is done in manufactured goods, which amount to 58 per cent on the whole turnover. The trade is chiefly carried on by the manufacturers, to whose share 75 per cent of the whole trade falls, the remaining 25 per cent falling to merchants. These fairs form a perfectly separate group, without almost any connection with the remaining fairs, although the same manufacturers and wholesale merchants take part in them as at Nizhni-Novgorod, but the goods from the latter are not transported to the Ukrain fairs, and vice versa.

At the present time the largest trade is done at the Kreschensk fair at Kharkov. It moreover always occupied the most prominent position among the Ukraine fairs, and chiefly served for the sale of the summer kinds of cotton stuffs. In the fifties and sixties the goods were still brought to the fair in carts, whose number exceeded 100,000. At the present time the sale of goods at this fair amounts to 15,000,000 roubles; that is, it has almost doubled during the last twenty years. The

\* This table gives the value of the goods sold, as there are no full data for the value of the goods brought to the fairs of the Ukraine.

Ilinsk fair at Poltava is just the opposite in this respect, for its trade has fallen from 15 million roubles to 2,800,000 roubles. Although 1891 was an exceptionally bad year for this market, but in general the merchants are always complaining of its decline. An yet in 1874 its turnover amounted to 22 million roubles. This decrease in the trade of the Ilinsk fair is explained by the central position of Kharkov compared with Poltava, and greater convenience of Kharkov for trading purposes. Nevertheless the trade of the Kreschensk fair has also fallen compared with what it was in 1873, when it amounted to 22,500,000 roubles. The Kreschensk fair is the place of meeting for all the merchants of Little Russia, and also for many from the governments of Kursk, Voronezh, Ekaterinoslav, thë Crimea, Caucasus, Don, and certain other localities. The Kreschensk fair bears more the character of a fair for manufactures than any of the other Ukraine fairs, as 50 per cent of its trade is done in manufactured goods from Moscow, Ivanovo-Voznesensk, Poland and St. Petersburg. A large trade is also done in leather, and boots and shoes, which are brought from Moscow, Elets, Kursk, Kimry, St. Petersburg, and other localities, and also in sheet iron and copper brought from the Urals. The adjacent governments send the following chief goods to the fair: wool, sheep skins, untanned hides, butter, tallow, honey, feathers, down and bristles. The results of the Kreschensk fair reflect themselves on the business of all the other succeeding Ukraine fairs.

The Ilinsk fair has a similar character. This fair was formerly held at Romny, and it was transferred to Poltava with a view to increasing the importance of the government town of Poltava; and it also had the effect of increasing the trade of the fair, as its transfer to a more southern point fully corresponded to the general direction of the trade, in virtue of the importance gained by the Novorossisk region. Its turnover began increasing considerably from the first year of its transfer in 1853. The chief importance of the Ilinsk fair is due to the buying of tissues for the winter season. Hence, a brisk trade was always done in cloths and other woollen stuffs, and furs, and in this respect it has always surpassed the Kreschensk fair, which dealt chiefly in summer tissues.

The Troitsk fair is the chief wool fair in Little Russia. Wool from the governments of Kharkov, Poltava, Kherson, Ekaterinoslav and Tauride, is brought to this fair, chiefly in an uncleaned state. In 1889, 410,000 pounds of wool were sold to the value of 3,500,000 roubles. The entire success of the fair depends upon the wool trade. The wool is chiefly bought for Moscow, Poland, and Klintay, as well as by foreign merchants.

The Ouspensk fair has also the predominating character of a wool fair, although the trade done is not so considerable as at the Troitsk fair, being 1,470,000 roubles in 1889. The chief trade is in the wool which remains unsold at the preceding fairs, and also in washed wool from the Kharkov and Belogorodsk wool-washing establishments.

The Pokrovsk fair deals chiefly in manufactured goods, which in 1889 were brought to the value of 5,000,000 roubles. Wool was also sold to the value of 500,000 roubles. The sale of tanned hides also plays an important part in this fair. The remaining fairs of the Ukraine are of a secondary importance.

The Korennaya fair is held about the ninth Friday after Ascension day, and lasts twenty days. It was formerly held on the Korennaya plain near Kursk, but is

now held at Kursk itself. This fair dates from the XVII century and it was especially important at the close of the eighteenth century, when there were over a thousand merchants in Kursk. Its chief trade was abroad. Besides foreign, large quantities of the following goods were bought by Moscow: honey, hemp, tallow, wax, hempseed oil, bristles, horned cattle and horses. Coming in contact with Little Russia, the Korennaya fair was at the same time connected with the Makarievsk fair, and through it with the Irbit fair. Kursk was then the central point between the west and east of Russia, and between Moscow and the south. After the union of the Novorossisk region, the trade moved further to the south, and the centre of this trade passed over to Kharkov; and the Korennaya fair has now lost all its importance, especially since Kursk has been united to Moscow by a railway. In 1891 the value of the goods brought to the fair amounted to scarcely 850,000 roubles, while in 1868-72 it amounted to 5,600,000 roubles.

The Contract fair is held at Kiev from the 5th to the 26th of February. The trade done is really small, but now it has an importance to the entire south-western region, owing to its coinciding with the meetings of the agriculturists, sugar manufacturers, and other merchants and manufacturers at Kiev. During this period various dealings are done in land, corn, sugar and building contracts.

Besides these fairs in the south of Russia, the following have a certain importance. The Rozhdestvenno-Bogorodsk fair, at Rostov-on-Don, the Georgievsk and Semeonovsk fairs at Elizavetgrad, the Petropavlovsk fair at Yarmolinsk in the government of Podolia, and the Bakhmut fair at the town of that name. In general, trading at fairs is somewhat extended in the governments of Ekaterinoslav, Tauride and Kherson, although there are no particularly large fairs. The Urupinsk, Krivorozhsk, and Razdorsk fairs in the Don province, deal chiefly in cattle.

The principal horse fairs are those at Balta in Podolia, Lenchno in the government of Lublin, Berdichev in the government of Kiev, Nizhnedevitsk in the government of Voronezh, and certain others. Besides those already mentioned, the following wool fairs are of no little importance, at Kakhovka, Bakhmut, Rostov-on-Don, and Warsaw. The entire importation of wool to the Warsaw fair amounts to 70,000 pouds, chiefly washed wool. Besides local buyers, foreigners also come to this fair. In September there is a special fair held at Warsaw for trade in hops.

The following conclusions may be drawn from the preceding review of the Russian fairs: 1. That the growth of the fair-trade in Russia was chiefly assisted by the absence of convenient ways of communication, and that the closing of the river ways during several months of the year was more favourable to the growth of a fair-trade than a settled one. 2. That the fair-trade is generally in a transitional condition, and that certain fairs are even on the decline; while the settled trade, taking advantage of the perfected ways of communication and especially of the railways, is gradually developing at the expense of the fair-trade. 3. That the Nizhni-Novgorod fair can hardly lose its importance, although it has stopped in its growth, owing to the special position which it occupies in the economic life of Russia.



## CHAPTER XXVI.

**The Consumption of fuel for Industrial purposes.**

**I**N Russia both vegetable and mineral fuel are used in the industries. The first includes wood, peat and straw, and the latter, the various kinds of coal from anthracite to lignite, and also naphtha and its products. In some localities fuel of animal origin, namely dried manure, is also used, but as it nowhere has any industrial importance, it will not be mentioned further.

No so long ago, when the manufacturing industries were inconsiderable and the railways few, the question of fuel did not play an important part in Russia, and the works and factories were generally erected in the proximity of forests, whose exploitation was easy. Owing to the then existing views upon the economic importance of fuel, the then existing policy did not in any way hinder the importation of all kinds of fuel from other countries, and thus evoked a more energetic exploitation of combustible materials within the limits of the Empire.

The chief force of the Western European industry, coal, whose production in Great Britain and on the Continent increases every year, was let into Russia free of duty; thanks to which, in many places and especially near the European frontier, many Russian industries were supported exclusively by foreign coal. It was frequently cheaper than the Russian fuel, which in the absence of convenient means of communication did not receive a wide application. If to this be added the freight policy of certain of the railways, which took upon themselves to transport coal from the frontier under more favourable conditions than from the interior, it will be readily understood why the Russian coal trade has developed so slowly.

The change in the Russian customs policy, directed towards the protection of the home production, had a favourable influence upon the branch of industry under consideration. The brisk development of industrial enterprise, combined with the increased goods traffic upon the railways and water ways, which have been distinctly observable in recent years, reflected themselves in a considerable increase in the demand for Russian mineral fuel. However, notwithstanding the great strides

made by this industry, which will be afterwards proved by figures, the chief resource of Russia still remains vegetable fuel, which is more used than any other in every class of Russian industry. Although vegetable fuels in the form of wood, charcoal, peat and straw, form the predominating combustibles in Russia, yet unfortunately, owing to the unsatisfactory registration of the yield of wood and peat from the State and private lands, there is no possibility of even approximately determining the total amount consumed as fuel. The consumption of straw, which forms the chief fuel in the grain-bearing steppes, is still more difficult to determine, although hundreds and thousands of portable engines, employed in the thrashing of the grain, consume huge amounts of this fuel. These engines, which, from their class of work, are moved from place to place about the steppes, cannot have a cheaper fuel than straw, which generally has no value at the place of its production. Not to speak of the steppe region of the Northern Caucasus, which is deprived of any other kind of fuel, even the rich coal-bearing province of the Don Cossacks exclusively employs straw as fuel in the agricultural portable engines. In some instances even factories find this fuel the more profitable.

Neither can the consumption of vegetable fuel in Russia, vast areas of which are thickly covered with forest, be determined from the data of its transport by rail and water, as the chief mass of the wood, charcoal, straw and peat, is transported by carts, and does not fall to the lot of those transport routes where an account is registered. However, in the absence of other data, it may be well to cite the totals of the transport of these materials by rail and water.

The railway returns only treat of the transport of wood fuel, which during recent years was as follows:

|                            |                            |
|----------------------------|----------------------------|
| 1884 — 157,530,000 pounds. | 1888 — 150,599,000 pounds. |
| 1885 — 145,107,000 »       | 1889 — 158,580,000 »       |
| 1886 — 143,117,000 »       | 1890 — 151,526,000 »       |

The chief railways by which the wood is transported are: the Moscow-Brest 28.3 million pounds, the Orel-Vitebsk 25.9 million pounds, and the Nicholas Railway 17.1 million pounds; that is, almost half of the whole transport of wood by rail. The wood transported by the above mentioned railways is chiefly directed towards Moscow, which in 1890 received 55.5 million pounds. If it be taken into consideration that wood, as a comparatively cheap fuel, cannot bear a distant transport in carts, and that the near neighbourhood of Moscow cannot offer a large quantity of this fuel, and if the water transport of 3.2 million pounds on craft and rafts be added to the transport by rail, then it is found that the consumption of wood in Moscow does not exceed 60 million pounds, which, with its large population and manufacturing industries, must be owned as very inconsiderable. But this is explained by the fact that Moscow has in recent years begun to prefer mineral fuel, in the form of coal and naphtha, to vegetable fuel. The remainder of the wood is distributed among the other towns of the Empire.

The returns of the water transport of wood fuel only concern European Russia, with the exception of Finland, Poland and the Caucasus. According to the returns of the internal water ways for 1890, altogether 138 million pounds were

transported by craft and 69.7 million pouds on rafts, or altogether 207.7 million pouds. The greater portion is transported through the basin of the Neva, together with lakes Ladoga, Onega. and Ilmen through which 124.6 million pouds were transported by craft and 49.4 million pouds by rafts, or 90 per cent in the former, and 70 per cent in the latter instance. Altogether 28.2 million pouds were transported through the basins of the Dnieper, West Dvina, Nieman and Vistula, the greater part being transported on rafts. There were 3.9 million pouds registered for the basins of the Don, Dniester and Narova. Thus the Neva appears as the most important route for the transport of wood fuel. Altogether 92.5 million pouds of wood fuel were floated down this river. Out of this amount St. Petersburg receives 81.4 million pouds; Schlüsselburg and Sheremetevka, 1 million pouds; and the remaining stations, 10.1 million pouds. The transport is exclusively by craft. St. Petersburg offers the largest market for wood fuel transported by water, as it consumes 38 per cent of the wood transported by all the internal water ways of Russia. Among other towns which play an important part in this transport, mention may be made of the following: Kiev, which receives 11.5 million pouds; Kazan, 10 million pouds; Ekaterinoslav, 10 million pouds; Tver, 7.8 million pouds; Kineshma, 5.7 million pouds; Saratov, 5.4 million pouds, and Nizhni-Novgorod, 5.2 million pouds.

The coasting transport of wood fuel is only of importance for the Baltic and Caspian seas. By the former, 4,811,000 pouds were transported, and by the latter 1,463,000 pouds. The chief points of consumption along the Baltic Sea are Riga, 1,546,000 pouds; St. Petersburg, 1,139,000 pouds; Libau, 1,109,000 pouds; and along the Caspian, Baku which receives 1,265,000 pouds from Lenkoran and Astara. On the Black and Azov seas the chief points of consumption are Odessa, 344,000; Batoum, 276,000; Kertch, 196,000; Nicolaev, 193,000, and Sebastopol, 103,000 pouds, which are chiefly furnished by the Black Sea coasts of the Caucasus, from Soukhoum 361,000; Poti 287,000, and Gelendjik, 158,000 pouds. The coasting transport of wood along the White Sea is of no importance.

In speaking of the transport of wood fuel, a few words should be said about the importation and exportation of this material: but direct data are wanting, as the importation of wood fuel is included under the general category of «timber goods of all kinds not especially mentioned», and its amount is given together with other analogous goods. As regards the exportation only the value of the wood fuel is given, without mentioning the amount, and this total value does not exceed 400,000 roubles. A certain insight can be gained from the railway returns, which show that 7.8 million pouds of wood fuel are dispatched to the ports of the Baltic Sea, 2.2 million to the Black Sea, and 0.3 million pouds to the Prussian frontier overland. From this it may be gathered that the Russian export and import of wood fuel is not of great importance.

Notwithstanding the vast extent of the peat bogs of Russia, which cover more than 100,000 square versts, to a depth of over 1 sagene, peat has everywhere only a local application as fuel. Endeavours made to extend the peat industry, that is, to organize its exploitation, sort, dry and press it, have only met with the desired success in certain places; and therefore the working of this combustible has almost everywhere a purely accidental character, and the amount of its production does not correspond to

the actual stores. This may partly be explained by the fact that the exploitation of peat has to be carried on in the summer, and the people are unaccustomed to it, while the use of wood has become general. The largest working of peat is carried on in the governments of Moscow, Vladimir, Nizhni-Novgorod, Riazan, Tambov, Kiev, Kharkov, Kursk, and Orel, and also in some of the western and Baltic governments. These peat bogs belong to the State, and to private individuals; the former keeps a regular account of the production of peat, while the latter do not keep any account whatever. From certain data it may be concluded that the central governments produce from 40 to 45 million pouds of peat, and the western and Baltic governments, 15 million pouds, or altogether 60 million pouds a year. As this combustible is chiefly employed at factories and works, and also upon railways, the most important points and the amounts of its consumption, will be mentioned hereafter.

The data respecting the consumption of straw are even less satisfactory than those concerning peat, and to what has been already said there may be added only very little more. Until the sixties straw was used as fuel only in peasant homes; but with the development of steam thrashing it grew to be the predominant fuel for the portable engines in large households of rural economy. In the steppes, and most of the Chernoziom governments of Russia not rich in wood, or distant from the localities where mineral fuel is extracted, straw plays a conspicuous rôle as fuel. As no data exist with reference to the quantity of straw consumed in this way, it remains only to point out the respective qualities of the different kinds of straw. Flax straw, containing the largest quantity of carbon and hydrogen and giving a small amount of ash, is preferred to all other sorts; next follow the rye and wheat straw; and the last place is held by the buckwheat and millet straw.

More full statistical information exists with reference to mineral fuel, that is, coal and naphtha. Those relating to the extraction and consumption of coal are as follows.

| Y E A R S.     | HOME PRO-   | IMPORT.     | EXPORT.   | TOTAL<br>AMOUNT OF<br>COAL IN<br>RUSSIA. | SATISFAC-                        |
|----------------|-------------|-------------|-----------|--|----------------------------------|
|                | DUCTION.    |             |           |  | TION OF<br>WANTS BY<br>HOME PRO- |
|                |             |             |           |  | DUCE.<br>Per cent.               |
| 1881 . . . . . | 213,258,477 | --          | --        | 321,549,580                              | 81.2                             |
| 1885 . . . . . | 260,577,779 | 106,343,000 | --        | 366,738,637                              | 71.0                             |
| 1886 . . . . . | 279,393,439 | 107,090,000 | 107,090   | 336,203,738                              | 72.0                             |
| 1887 . . . . . | 276,778,774 | 87,001,160  | 294,225   | 363,485,709                              | 76.1                             |
| 1888 . . . . . | 316,593,914 | 96,588,431  | 1,252,251 | 411,930,094                              | 79.8                             |
| 1889 . . . . . | 379,350,192 | 114,255,404 | 996,835   | 492,638,761                              | 77.0                             |
| 1890 . . . . . | 367,204,045 | 94,164,382  | 834,726   | 460,533,701                              | 76.7                             |

The above data show how fast the home production increases, and how at the same time the foreign import thereof declines. The export of coal from Russia bears un-

til now an incidental character; thus, the consumption of coal in Russia is determined by the home production and foreign import.

The state of the production of coal in Russia may be seen from the following data.

| YIELD OF COAL IN THE<br>BASINS OF: | 1890.                             | 1889.   | 1888.   | 1887.   | 1885.   | 1881.  |
|------------------------------------|-----------------------------------|---------|---------|---------|---------|--------|
|                                    | T H O U S A N D S O F P O U D S . |         |         |         |         |        |
| Donets . . . . .                   | 183,249                           | 189,869 | 136,760 | 125,484 | 114,946 | 91,298 |
| Poland . . . . .                   | 150,793                           | 151,109 | 147,357 | 121,156 | 109,282 | 85,775 |
| Near Moscow . . . . .              | 14,268                            | 18,697  | 16,865  | 17,589  | 21,308  | 23,426 |
| Ural . . . . .                     | 15,224                            | 16,040  | 12,757  | 9,972   | 10,875  | 10,031 |
| Kouznetsk, government of Tomsk     | 1,052                             | 895     | 1,010   | 808     | 795     | 487    |
| Littoral region, Saghalin. . . .   | 893                               | 650     | 600     | 556     | 550     | 318    |
| Caucasus . . . . .                 | 605                               | 667     | 511     | 216     | 213     | 218    |
| Turkestan . . . . .                | 301                               | 423     | 426     | 366     | 417     | —      |
| Kiev-Elisavetgrad . . . . .        | 693                               | 853     | 215     | 559     | 555     | 584    |
| Kirghiz steppe . . . . .           | 127                               | 175     | 92      | 73      | 1,634   | 1,651  |
| Onega . . . . .                    | 1,8                               | 1,1     | —       | —       | —       | 70     |

From these data it may be seen that the greatest amount of coal is produced in the Donets and Polish regions, in which the production has been systematically rising during the last decade. The other regions mainly supply the local wants, therefore special attention should be paid to the first region, which is so rich in deposits of coal that it can supply Russia with fuel not only for many a century, but also can export great quantities of it, as the exploitation of coal deposits in that region, begun in the sixties, has greatly increased. In the Donets basin the area of the coal deposits attains 25,000 square versts. If it be admitted that each square verst contains 50,000,000 pounds of combustible coal, though in reality there is much more of it, it will be found that the above-mentioned region possesses 1,250,000,000 pounds coal, which form an exhaustless source for all the present and future demands of Russia, however great they may be. The favourable geographical position of this region guarantees still more all the home demands for this fuel, and it is to be hoped that the competition which has recently begun between foreign and Donets coals will soon terminate to the advantage of the latter.

The above mentioned deposits are also the principal points from which coal is transported by rail and water ways. It must, however, be observed that, owing to coal being so cheap, it is seldom transported long distances by railways; generally such factories as have great use of it, are concentrated near the coal mines, so that the fuel is brought to them in carts or by tramways. Until now very small quantities of coal are transported by water, although it is the cheapest method. Near the Donets mines flows the river of the same name, but it is not as yet adapted to the transport of coal. Of the 460,000,000 pounds of coal, consumed in 1890, 266,900,000 pounds were carried in the same year by rail, and 3,900,000 by the interior water ways;



and of the remaining 130,000,000 pouds, a part was consumed on the spot, a part transported in carts, and some transformed into coke. The distance which this fuel has been transported by railways is 82,900,000,000 pound-versts, which forms on the average 311 versts per poud of coal. The railroads which carried coal in 1890, and which can be divided into two groups, one consisting of such as transport more coal than they consume, and the second of such as consume more than they transport, are as follows:

| R A I L W A Y S.                 | TRANSPORT-<br>ED, IN MIL-<br>LIONS OF<br>POUDS. | RECEIVED,<br>IN MILLIONS<br>OF POUDS. |
|----------------------------------|---|---------------------------------------|
| Warsaw-Vienna . . . . .          | 90.4  | 59.8                                  |
| Donets . . . . .                 | 73.7  | 11.6                                  |
| Kozlov-Voronezh-Rostov . . . . . | 22.4  | 17.8                                  |
| Ivangorod-Dombrovsk . . . . .    | 17.5  | 7.8                                   |
| Ekaterininsk . . . . .           | 16.8  | 21.9                                  |
| Kursk-Kharkov-Azov . . . . .     | 13.4  | 20.3                                  |
| Lodz . . . . .                   | 0.2   | 24.5                                  |
| Moscow-Kursk . . . . .           | 1.1   | 10.7                                  |
| Kharkov-Nikolaev . . . . .       | —   | 16.2                                  |
| South-Western . . . . .          | 8.8   | 11.1                                  |

Russian coal, as has been already mentioned, is not carried by rivers, as the total transport by the interior water ways amounted in 1890 to only 3,900,000 pouds, of which Samara alone received 1,500,000 pouds. If it be added thereto, that 15,800,000 pouds were transported by coasting vessels, of which 15,600,000 by the Black Sea, the principal points of departure being Marioupol, 6.3 million pouds; Taganrog, 2.3 million pouds; and Rostov 4.2 million pouds; the principal destinations, Odessa, 6.9, and Kerch, 2 million pouds, the total amount of coal transported by water in the limits of Russia, will be obtained. The seas are of special importance for the import of coal, as more than 90 per cent of it comes in that way; of these the principal are: the Baltic, 74.6 million pouds; Black Sea, 9.5; and White Sea, 0.3 million pouds. The principal ports to which coal is imported are: St. Petersburg, 57.3 million pouds; Riga, 9.3; Odessa, 8.6; Libau, 3.6; Reval, 3.0; and Sebastopol, 0.6 million pouds.

By summing up the information received in 1890 concerning the principal points of coal consumption, it will be found that St. Petersburg consumes 52 million pouds (receives 57.3, and transmits 5.3 million pouds); Warsaw consumes 29.8; Odessa, 16.4 millions, receives by railway 3 millions, from abroad 8.6, by coasting, 6.9, and exports by railway 0.6, and by coasting, 1.6 million pouds; Rostov-on-Don consumes 10.6 million pouds; receives by railroad 15 millions, exports by coasting, 4.2, and by railways, 0.2 million pouds; Moscow consumes 8.3 millions, receives by railways 8.5 and exports 0.2 million pouds.

In conclusion it must be observed that data given by railroads concerning the transport and consumption of coal include not only pit coal but also wood coal, peat

and coke, but the customhouse gives separate data concerning coke and pit coal. Thus, for example, the import of coke amounted in 1891 to 12,300,000 pounds, distributed in the following manner: Sosnovitsy, 5,800,000; Granitsa, 3,100,000; and St. Petersburg, 2,600,000 pounds.

Naphtha, naphtha residues, and similar liquid combustible materials, appeared in the Russian trade some 20 or 30 years ago, and since then the demands for them have increased yearly. Owing to some technical conveniences in the using of this fuel, as also to its low price, it competes successfully not only with wood, but also with pit coal. Without stopping to examine the physico-chemical nature of this kind of fuel, only the statistics of its production and consumption will be discussed here. It consists of raw naphtha, or still oftener of what is called naphtha residues, that which remains after naphtha has been distilled for obtaining different lighting and greasing oils.

By the Russian method of distillation only 33 per cent of refined products is obtained from the crude material, so that 67 per cent are residues. Only the production of raw naphtha can be more or less precisely calculated, but there are no data showing the amount of naphtha residues. Taking, however, the above-mentioned relation between naphtha and its residues into consideration, the quantity of the latter can be approximately calculated. Hereto it must be added that about 5 per cent of the raw naphtha is used as fuel, on the local engines and in houses.

| Y E A R S.     | QUANTITY OF<br>NAPHTHA<br>PRODUCED. | USED ON THE<br>SPOT AS FUEL. | QUANTITY OF<br>NAPHTHA DIS-<br>TILLED. | RESIDUES<br>OBTAINED. |
|----------------|-------------------------------------|------------------------------|--|-----------------------|
|                | M i l l i o n s o f p o u n d s     |                              |  |                       |
| 1881 . . . . . | 41                                  | 2                            | 38                                     | 25                    |
| 1885 . . . . . | 116                                 | 5                            | 110                                    | 73                    |
| 1886 . . . . . | 120                                 | 9                            | 114                                    | 76                    |
| 1887 . . . . . | 166                                 | 8                            | 158                                    | 105                   |
| 1888 . . . . . | 194                                 | 10                           | 184                                    | 123                   |
| 1889 . . . . . | 202                                 | 10                           | 192                                    | 127                   |
| 1890 . . . . . | 242                                 | 12                           | 231                                    | 154                   |

Of this quantity of residues about 15 per cent is employed for the distillation of naphtha; but how much is used for other local demands, such as the heating of steam engines with naphtha and kerosene, as also mechanical and other factories, is unknown. Judging, however, by the fact that from the principal centre of the Russian naphtha industry, Baku, were shipped, in 1890, 96.9 million pounds of residues, and in 1892, 116.8 million pounds, it may be supposed that the local consumption of liquid fuel is very considerable. Nearly the total amount of naphtha and its residues, used in the Russian trade, is produced from the government of Baku, as all the other naphtha-producing localities give only 0.8 per cent of the total quantity. Naphtha residues are exported as follows: 1. abroad, either by the Transcaucasian Railroad as far as Batoum, or through the south Russian Black Sea ports; 2. to Persia, by the Caspian Sea, through Astrakhan, the Volga, and the Transcaspien region. These are the only ways by which

the combustible liquid of the Apsheron peninsula goes abroad, as until now naphtha and its residues are exported in small quantities, the total amount of the export not exceeding 2,500,000 pounds.

Of the 96.9 million pounds of naphtha and its residues shipped from Baku, in 1890, by the Caspian Sea, part was used as fuel for the Caspian fleet, part exported to Persia, and only 85.7 million pounds sent by coasting vessels, of which 83.1 millions went to Astrakhan. In the latter town, as well as in Tsaritsin, there are storehouses for this combustible; the Volga fleet, mechanical works, glass factories and others, get their supply of fuel here, and the remaining quantity of naphtha is sent, according to demands, up the Volga. Thus, in 1890 by that river were conveyed 44.3 million pounds, which were distributed between the principal harbours in the following manner: Nizhni-Novgorod, 13.7 million pounds; Tsaritsin, 11.7; St. Petersburg, 6.6; Saratov, 3.1; Kazan, 2.8; Yaroslav, 2.5; Samara, 2.1; Rostov-on-Don, 0.5; Kineshma, 0.4; Rybinsk, 0.3; Perm, 0.3; Kostroma, 0.2; and Moscow 0.04 million pounds, all which formed a total of 38.2 million pounds. On all these harbours part of the naphtha is consumed on the spot, part is carted to the neighbouring works and factories, and the principal mass is transported by rail to different towns.

In 1890, 34,500,000 pounds of residues were carried by different railroads in the following proportions: Griaze-Tsaritsin transported 6.6 million pounds; Kozlov-Saratov, 1.2; Moscow-Nizhni-Novgorod, 14.2; Moscow-Riazan, 1.1; Moscow-Yaroslav-Vologda, 2.5; Orenburg, 1.6; Sysran-Viasma, 0.3; Shouisk-Ivanovsk, 0.5. Hereto must be also added a part of the fuel, namely, 3.5 million pounds, sent from Baku by the Transcaucasian Railway, through Batoum-Poti to the northern ports of the Black Sea. It is to be understood that the most considerable points of export of naphtha and its residues, are those stations of the above-mentioned railroads, as have the nearest connection with the water ways. But, as they only serve as transmitting points, and have no independent importance, it is necessary, in order to have a clear idea of the distribution of liquid fuel throughout the Empire, to point out the railway stations where naphtha is principally consumed.

In that respect Moscow occupies the first place, consuming 11.2 million pounds, which forms one-third of the whole amount transported; next come Batoum, 2.3; Orekhovo, 2.1; Griaze, 1.4; Bogorodsk, 1.3; Novorossisk, 1.0; Kozlov, Riazan, Riga, and Muhlgraben, 0.8 each; Kouskovo \*, 0.7; Karabanovo, 0.6; Tifis and Ivanovo, by 0.5; and St. Petersburg, 0.3. If thereto be added the quantities transported by water, then St. Petersburg and Moscow are the two principal markets for the consumption of naphtha and its residues, the former using 6.9, and the latter, 11.5 million pounds. It is true that a part of this material is used for making gas, and for other technical wants, but still the greatest part of it serves as fuel.

Thus, having given a general idea of the production of different combustible materials, and their distribution throughout the Empire by rail and water ways, the separate industries consuming these materials may now be examined; such are: 1. works and factories; 2. the metallurgical industry; 3. railways; 4. steamers on the interior water ways, as corresponding informations exist.

\* Kouskobo near Moscow and some other localities receive naphatha for the manufacturing of illuminating and greasing oils.

## THE CONSUMPTION OF FUEL AT FACTORIES.

The statistic of works in Russia do not as yet stand on a firm foundation. If there are reasons to complain that the data showing the consumption of raw material, and the production of the factories, are not satisfactory, the figures as regards the quantity of fuel used are still more incomplete. The reason of this is that, in localities where fuel is cheap, its consumption is not registered, and such factories as do register it, have not been included in the data published by the Department of Trade and Manufactures. Therefore, the under-mentioned data must be considered as relative only, and of no great importance. They concern the following eight groups :

I. The manufactures from fibrous materials, including the spinning and weaving industries from cotton, flax, hemp, jute, wool, and silk; dyeing and printing of stuffs; production of rope and thread; the manufacture of tarpaulin, and other impermeable tissues.

II. The manufacture of foodstuffs, such as groats, flour, oils, molasses, malt, confectioneries, preserves, salt, sugar, cheese, spirits, artificial mineral waters, and the like.

III. Chemical productions: acids, lyes, and salts, colours, varnish, paraffin and cosmetics.

IV. Manufactures of tallow, wax, hides, furs, bone, glue, hair, bristles and others.

V. Manufactures of wood, the making of furniture, and wooden goods, horn-articles and dry distillation of wood.

VI. Manufacture of metals: cast-iron, and steel productions, the making of iron, and machine construction, production of wire and nails, articles from copper, bronze, silver, gold, and others.

VII. The manufacture of clay: brick, cement, pottery, earthenware and glass productions.

VIII. Paper, pasteboard, tapestry, and the like.

IX. This section contains all that has not been included in the preceding groups, as equipages, gutta-percha articles, mineral, illuminating, and greasing oils, gun powder, graphite, musical instruments, and the like.

From the below table it is seen that the manufacture of fibrous materials consumes more fuel than any other in the Empire; it uses 34 per cent of wood, 20 of pit coal, 72 of peat, and 34 per cent of liquid fuel. In order to give an idea of the relative consumption of one or another sort of fuel, it may be considered that 1 cubic sagine of wood = 100 pounds of pit coal = 225 pounds of peat = 60 pounds of naphtha residues. Of course these relations, dependent on the quality of the fuel and the manner of using it, are not always uniform, but are sufficiently exact for approximate comparisons. By transferring, according to this calculation, the consumption of coal, peat, and naphtha, to wood, it will be found that 1,178,000 cubic sagnes of wood are required for the manufacture of fibrous materials, and that in reality 44 per cent of wood, 27 per cent of coal, 13 per cent of naphtha, and 16 per cent of peat were used.

The following table shows the quantity of fuel consumed by each of the above-mentioned manufactures.

| MANUFACTURES.   | WOOD IN<br>CUBIC SA-<br>GENES *. | COAL IN<br>POUDS **. | PEAT IN<br>POUDS ***. | NAPHTHA<br>RESIDUES<br>IN POUDS. | THE TOTAL<br>QUANTITY<br>OF FUEL<br>CONSUMED<br>IN CUBIC<br>SAGENES. |
|---|----------------------------------|----------------------|-----------------------|----------------------------------|--|
| Of fibrous materials . . . . .                                  | 525,260                          | 31,810,000           | 33,297,000            | 11,763,000                       | 1,178,000  |
| > foodstuffs. . . . .   | 241,096                          | 30,708,000           | 4,348,100             | 3,430,425                        | 625,000  |
| > chemical products. . . . .                                    | 53,116                           | 6,275,140            | 338,000               | 763,100                          | 130,000  |
| > animal    > . . . . .   | 49,599                           | 2,667,200            | 253,000               | 799,770                          | 91,000   |
| > wood       > . . . . .  | 53,365                           | 426,270              | 51,000                | 46,200                           | 59,000   |
| > metal       > . . . . .                                       | 137,524                          | 69,456,000           | 1,923,000             | 966,045                          | 855,000  |
| > clay, sand and the like (Ce-<br>ramics) . . . . .             | 349,884                          | 13,970,830           | 4,848,000             | 753,900                          | 621,000  |
| > paper materials . . . . .                                     | 98,974                           | 5,544,432            | 655,000               | 237,000                          | 161,000  |
| Manufactures not mentioned in<br>the preceding rubrics. . . . . | 11,614                           | 1,950,190            | 100,000               | 6,767,000                        | 311,000  |
| Total. . . . .  | 1,521,032                        | 162,808,062          | 45,813,100            | 35,526,440                       | 4,031,000  |

In the manufacture of foodstuffs the predominating fuel is coal, naphtha and peat being here of still less importance than even in the manufacture of fibrous materials. Pit coal has the same predominating importance in the chemical, and still more in the metal and wood manufactures, exceeding by 6 times the quantity of wood fuel consumed. In the manufactures belonging to the ninth group, the first place is occupied by liquid fuel, owing to the fact that this group includes the naphtha distilling industry, which alone consumed, in 1890, 16,507,547 pouds of naphtha residues.

Thus the works and factories of the Empire consumed in 1890, according to registered information such a quantity of different fuel as would equal 4,000,000 cubic sagenes of wood, of this quantity 29 per cent were used for the manufacture of fibrous materials; 21 per cent, for that of metals; 15 per cent, for the manufacture of foodstuffs; and 14 per cent, in the ceramic industry.

The consumption of coal equals 1,628,000 cubic sagenes, or about 40 per cent; of wood, 38 per cent; naphtha, 15 per cent, and peat, 5 per cent. Such a predomination of mineral fuel over vegetable fuel merits serious attention, as only a short time ago the contrary could be remarked.

\* In the data, given by the Department of Trade and Manufactures fir wood cut into 10 to 12-inch billets is shown called *shvyrkov sagene*, but here, the *shvyrkov* sagene is transferred into cubic sagenes.

\*\* Together with pit coal, wood coal is also included in this rubric.

\*\*\* In the information given by the above mentioned Department, peat is shown in four different measures, all of which are transferred into pouds here; 1 cubic sagene of peat = 250 pouds, a piece = 4 pouds, and a carload = 610 pouds.

In order to survey the geographical distribution of the consumption of different fuel, it is most convenient to divide European Russia into 14 regions, as adopted in the introduction.

| R E G I O N S.                  | WOOD IN<br>CUBIC SA-<br>GENES. | COAL IN<br>POUNDS. | PEAT IN<br>POUNDS. | NAPHTHA<br>IN POUNDS. |
|---------------------------------|--------------------------------|--------------------|--------------------|-----------------------|
| I. Moscow central . . . . .     | 639,000                        | 8,911,000          | 31,148,000         | 14,573,000            |
| II. Baltic-St. Petersburg . . . | 228,000                        | 41,794,000         | 445,000            | 10,500                |
| III. Finland . . . . .          | —                              | —                  | —                  | —                     |
| IV. Northern . . . . .          | 24,000                         | —                  | —                  | —                     |
| V. Eastern . . . . .            | 182,000                        | 4,823,000          | 1,296,000          | 1,735,000             |
| VI. Siberia . . . . .           | 33,000                         | 2,000              | —                  | —                     |
| VII. Central Asia . . . . .     | 2,300                          | 50,000             | —                  | —                     |
| VIII. Caucasus . . . . .        | 16,000                         | 1,093,000          | 25,000             | 17,440,000            |
| IX. Southern . . . . .          | 9,000                          | 43,417,000         | —                  | 326,000               |
| X. South-western . . . . .      | 94,000                         | 1,584,000          | 238,500            | —                     |
| XI. Volga . . . . .             | 91,000                         | 50,533,000         | 5,100,000          | —                     |
| XII. North-western . . . . .    | 50,000                         | 323,000            | 350,000            | —                     |
| XIII. Little Russia . . . . .   | 22,000                         | 6,294,000          | 35,000             | —                     |
| XIV. Central Chernoziom . . .   | 132,000                        | 3,926,000          | 4,273,000          | 1,438,000             |

From the above table it is seen that the greatest quantity of wood is consumed by the Moscow Central region, namely, 40 per cent; next comes the Baltic-St. Petersburg region, 14 per cent; the eastern, 12 per cent, et cetera. Notwithstanding the considerable development of the trade and manufacturing industries in the above regions, the predomination of vegetable fuel there can be explained, on the one hand, by the abundance of wood, and on the other, by the fact that the coal mines are very far from them. The abundance of the latter in the Vistula region, and the proximity of mechanical works and factories for the manufacture of fibrous materials, explain the large consumption of coal in that locality. Wood is comparatively dear there, naphtha does not exist at all, and the quantity of peat is very inconsiderable.

#### THE CONSUMPTION OF FUEL IN METALLURGICAL WORKS.

The different metallurgical branches use a considerable quantity of fuel, but it is impossible to define by the statistics of the industry in Russia the total amount consumed by all of these branches. Data exist only concerning the iron, naphtha and salt industries; but there is no exact information, as to the consumption of fuel in other metallurgical works, such as the gold, silver, lead, zinc, copper, coal and others, although there are reasons to suppose that here also considerable quantities of fuel are used. Trials have been made to calculate the total consumption of wood at all the metallurgical works of European Russia, and that only for 1890. Not

having more exact informations, these figures, as officially published, are given below.

| W O R K S.   | QUANTITY<br>OF WOOD<br>PREPARED<br>IN CUBIC<br>SAGENES. | QUANTITY<br>OF WOOD<br>USED FOR<br>MAKING<br>COAL, IN<br>CUBIC SA-<br>GENES. | QUANTITY OF COAL<br>PROCURED. |               |
|--|---|--|-------------------------------|---------------|
|  |   |  | HEAP<br>COAL.                 | STOVE<br>COAL |
|  |   |  | IN CROWN HAM-<br>PERS *.      |               |
| Ural, Government . . . . .   | 135,518   | 127,844  | 311,059                       | 6,220         |
| » private . . . . .  | 54,637  | 60,454   | 93,856                        | 99,842        |
| »   » in the district of Perm. . . . .                                 | 185,954   | 112,113  | 145,188                       | 250,497       |
| »   »   »   »   »   » Verkhotoursk. . . . .                            | 141,990   | 133,234  | 334,361                       | 12,444        |
| »   »   »   »   »   » Eastern Eka-<br>terinburg. . . . .               | 115,961   | 111,000  | 248,212                       | 12,661        |
| »   »   »   »   »   » Western Eka-<br>terinburg. . . . .               | 188,011   | 145,278  | 298,397                       | 5,629         |
| »   »   »   »   »   » Ufa . . . . .                                    | 235,617   | 167,425  | 232,519                       | 81,634        |
| Caucus . . . . .   | 548   | 548  | 1,350                         | —             |
| Olonets. . . . .   | 6,991   | 4,192  | 7,765                         | 10,931        |
| Poland. . . . .  | 73,392  | 53,112   | 121,749                       | —             |
| Beyond Moscow. . . . .   | 133,442   | 84,837   | 145,924                       | 27,020        |
| Of the south-western district . . . . .                                | 25,522  | 11,120   | 13,853                        | —             |
| Total of all the metallurgical works of Euro-<br>pean Russia . . . . . | 1,291,520   | 1,011,194  | 1,948,223                     | 507,028       |

More exact information exists concerning the three above mentioned manufactures, namely, the iron, naphtha distilling and salt-making industries. Data, showing the consumption of fuel at works preparing cast-iron, iron and steel, are seen from the following table.

| CONSUMPTION OF FUEL.             | Y E A R S. |            |            |            |
|----------------------------------|------------|------------|------------|------------|
|                                  | 1890.      | 1889.      | 1888.      | 1887       |
| Wood, in cubic sagenes . . . . . | 816,331    | 746,841    | 924,852    | 924,266    |
| Wood coal, in hampers . . . . .  | 2,868,313  | 2,600,058  | 2,914,157  | 2,516,631  |
| Anthracite in pouds . . . . .    | 2,465,154  | 2,188,410  | 36,802,008 | 46,525,140 |
| Pit coal   »   » . . . . .       | 20,383,770 | 25,215,593 |            |            |
| Coke   »   » . . . . .           | 39,238,463 | 19,322,559 | 1,488,009  | 2,882,331  |
| Naphtha   »   » . . . . .        | 1,625,367  | —          | 155,000    | 120,000    |
| Peat, in cubic sagenes. . . . .  | 15,175     | 16,583     | 17,914     | 21,500     |

\* A crown hamper, called *korob*, contains 70 $\frac{1}{4}$  cubic feet, weighing about 28 pouds.

From the above table it is seen that the principal fuel in the Russian iron manufacture is wood though during recent years it is being visibly replaced by coal; naphtha, as well as peat, is of no importance here.

The following table shows the distribution of fuel in the iron works of the different metallurgical districts.

| FUELS.              | D I S T R I C T S |           |           |                                    |            |          |          |
|---------------------|-------------------|-----------|-----------|------------------------------------|------------|----------|----------|
|                     | Ural.             | Moscow.   | Poland.   | Southern and south-western Russia. | Northern.  | Siberia. | Finland. |
| Wood cubic sageses  | 577,078           | 147,541   | 35,810    | 2,350                              | 20,397     | 11,407   | 21,748   |
| Charcoal, hampers.  | 2,152,757         | 336,641   | 176,786   | 17,658                             | 21,831     | 44,927   | 118,710  |
| Anthracite pouds    | 35,154            | —         | —         | 2,430,000                          | —          | —        | —        |
| Pit coal >          | 2,045,410         | 1,078,388 | 1,997,728 | —                                  | 14,465,806 | 263,258  | 533,180  |
| Coke >              | 23,576            | 56,207    | 7,146,353 | 30,901,703                         | 1,104,509  | 5,565    | —        |
| Naphtha >           | —                 | 1,625,367 | —         | —                                  | —          | —        | —        |
| Peat cubic sageses. | 10,175            | 5,000     | —         | —                                  | —          | —        | —        |

Thus, in the Ural, Moscow and Finland districts, the predominating fuel is the vegetable; in the southern and northern, mineral fuel; and in the Polish and Siberian districts the consumption of vegetable and mineral fuel is about equal.

Salt is principally distilled in the Perm, Kharkov, Ekaterinoslav and Warsaw governments; and in the whole Empire, in 1890, this industry consumed 108,559 cubic sageses of wood, and 4,925,425 pouds of coal. The government of Perm alone uses of this quantity, about 80 per cent vegetable, and 50 per cent mineral fuel. The governments of Kharkov, Ekaterinoslav and Warsaw use for distilling salt only pit coal; and those of Vologda and Archangel, and the whole of Siberia, only wood.

The naphtha-distilling industry in the government of Baku, where there is no coal, and round about the numerous naphtha sources no vegetation, consumes great quantities of naphtha fuel. Thus, in 1890 the production of naphtha consumed at least 12,000,000 pouds of naphtha fuel, principally for heating the local steam boilers.

#### THE CONSUMPTION OF FUEL ON RAILROADS.

The Russian railways, dependent on the locality through which they run, consume different kinds of fuel, both of home production, and of imported. The following data show the quantity of different sorts of fuel consumed by Russian railroads. The Military Transcaspien, and the Finland railways are not included in the following table, as there are no exact data concerning them.



| DIFFERENT SORTS OF FUEL.   | 1890.      | 1889.      | 1888.      |
|--|------------|------------|------------|
| Wood of different sorts, in cubic sagesnes. . .                      | 602,036    | 655,518    | 651,021    |
| Wood coal in pouds . . . . .   | 393,463    | 406,716    | 337,707    |
| Donets anthracite in pouds. . . . .                                  | 5,121,151  | 5,992,555  | 6,940,523  |
| Pit coal, Russian and foreign, in pouds . . .                        | 75,437,639 | 78,274,383 | 78,517,321 |
| Briquettes in pouds . . . . .  | 551,361    | 780,514    | 962,033    |
| Coke   »   » . . . . .   | 358,613    | 332,180    | 289,144    |
| Peat   »   » . . . . .   | 3,131,958  | 3,107,162  | 2,502,523  |
| Naphtha   »   » . . . . .  | 17,654,607 | 12,994,112 | 8,707,559  |
| Total quantity of fuel, expressed in cubic sagesnes of wood. . . . . | 1,584,864  | 1,586,714  | 1,560,406  |

This last calculation is based on investigations made on railroads in 1890, concerning the substitution for one cubic sagine of wood, as to its heating power, of different sorts of fuel; thus, a cubic sagine of wood can be replaced by 117 pouds of wood coal, by 99 pouds of Donets anthracite, 98 to 100 pouds of Kouban and English coal, 108 pouds of smoked Donets coal, 117 pouds of Polish pit coal, 196 pouds of pit coal from the Moscow deposits, 101 pouds of coke, 101 pouds of briquettes, 227 pouds of peat, and 71 pouds of naphtha residues. These figures differ a little from the above, especially as regards naphtha.

In the total the consumption of fuel has increased in 1883 to 1,361,000 cubic sagesnes, and in 1890, to 1,585,000; this increase concerns principally naphtha, as to the others a decrease rather is to be noticed. Thus, the demands for anthracite decreased from 9,231,655 pouds in 1883 to 5,121,151 pouds in 1890, that is, to 45 per cent.; that of pit coal grew from 61 million pouds in 1883, to 75 millions in 1890, the greatest increase being observed in the consumption of smoked Donets coal, from 20 to 39.8 millions, of the Ural from 1.7 to 5.7 millions, and of the Polish from 11.9 to 17.6 million pouds. The consumption of the other sorts of coal has decreased; of the Moscow deposits, from 9.8 million pouds to 5.4 millions, and of English, from 9.6 to 6.7 million pouds. A decrease is also observed in the using of briquettes, from 4 million pouds in 1883, to 0.6 millions in 1890; and a small decrease in that of coke. The demands for peat have visibly augmented, but this fuel has no serious importance for Russian railways. The consumption by railroads of naphtha fuel has increased exceedingly, from 115,605 pouds in 1881, to 17,654,607 pouds in 1890.

The predominating fuel of the Russian railroads is, however, pit coal, including not only pit coal from different localities, but also anthracite, coke, and briquettes. By expressing the above-mentioned quantities of coal in wood, according to the practically defined coefficients, it will be found that the total quantity of coal consumed by the Russian railways equalled 723,184 cubic sagesnes of wood; of vegetable fuel, including charcoal and peat, 612,543 cubic sagesnes were consumed; besides, the amount of naphtha in use was equal to 249,137 cubic sagesnes of wood. Thus, by

expressing these figures in per cents, it will be found that the consumption of coal amounted to 45.8 per cent; of wood, to 38.6; and of naphtha, to 15.6 per cent.

Passing over to the distribution of the different sorts of fuel in the separate regions, it will be found that wood is consumed in greater or less quantities on all railroads without exception; owing to this, the above fuel is distributed more equally than any other. The greatest quantity of wood is consumed by the Nicholas Railway, namely 13 per cent of the total; next come the South-Western, 12½ per cent; St. Petersburg-Warsaw, 9.6 per cent; Moscow-Brest, 7.4 per cent; and Orel-Vitebsk, 7 per cent.

The Donets smoked coal is consumed in a certain region; thus, the greatest demands for it are on the Kursk-Kharkov Railroad, namely 17.7 per cent; then come the south-western, 11.8 per cent; Moscow-Koursk, 11; the Ekaterininsk, Vladikavkaz and Kharkov-Nicholas railways, 10 per cent each; Donets, 9 per cent, and so on. A smaller quantity of this coal is used on the Lozovo-Sebastopol, Moscow-Brest, Kozlovo-Voronezh-Rostov railroads, and others. Coal of the Polish basin is principally consumed by the Warsaw-Vienna Railway, 36 per cent; the Vistula Railway, 23 per cent; Ivangorod-Dombrovsk, 13 per cent; Warsaw-Terespolsk, 10 per cent, and the like. The imported English coal is principally used on the Baltic Railway, which consumes 42 per cent of the total amount used by the whole network of roads; next, the Riga-Dunaburg, 14 per cent; Lozovo-Sebastopol, 12 per cent; Libau-Romny and Pskov-Riga, 10 per cent, and so on. The Donets anthracite is almost exclusively used by the Kozlovo-Voronezh-Rostov Railway, 76 per cent; and Vladikavkaz, 74 per cent. Naphtha residues are principally consumed, of course, by the Transcaucasian Railway, being the nearest to the naphtha deposits, namely 35 per cent; as also by the railroads in proximity to the cheap Volga-Caspian waterway, such as, the Griaze-Tsaritsin, 17 per cent; Orel-Griaze, 7 per cent; Riazan-Kozlov, and Moscow-Riazan, 6.8 per cent each; Syzran-Viazma and Moscow-Kursk, 6 per cent each; Tambov-Saratov, 5 per cent; also, small quantities of liquid fuel are used by the Baskoun chaks, Samara-Zlatoust, Orenburg, Moscow-Yaroslav-Vologda, Moscow-Brest, and other railroads.

The using of briquettes as a fuel is of no great importance; it is chiefly employed by the South-Western Railway, 58 per cent; the Fastovsk, 34 per cent, and the Moscow-Brest, 15 per cent. Coke, having a special signification, is used in small quantities by all the railroads. Finally, peat is only spread in the region of its production, and cannot bear distant transportation. It is only used on the Moscow-Nizhni-Novgorod, 78 per cent; and the Moscow-Riazan railways, 14 per cent.

#### CONSUMPTION OF FUEL ON RIVER STEAMERS.

The river steamboat navigation has considerably developed during recent years in Russia. In 1886 there were only 1,507 steamers on the rivers of European Russia, and in 1890 their number increased to 1,824. Together with the increase of the number of steamers, the quantity of fuel consumed by them increased accordingly; thus, in 1886 the amount of different fuels consumed equalled 655,000 cubic sagesnes of wood, and in 1890 it amounted to 896,000 cubic sagesnes. The following table shows the quantity and sort of fuel used on the different steamboats in 1890; at the end of the table are placed the totals for 1886.

| BASINS.                             | IN 1890.                              | Total number of steamers. | THE SORT AND QUANTITY OF FUEL USED BY THE STEAMERS. |  |                                |   |  |   |
|-------------------------------------|---------------------------------------|---------------------------|---|--|--------------------------------|---|--|---|
|                                     |                                       |                           | Wood.   |  | Pit coal.                      |   | Naphtha residues.                          |   |
|                                     |                                       |                           | Number of steamers using wood.                      | Total quantity of wood used by steamers during one navigation, in cubic sажenes. | Number of steamers using coal. | Total quantity of coal used by steamers during one navigation, in pounds. | Number of steamers using naphtha residues. | Total quantity of naphtha residues used by steamers during one navigation, in pounds. |
| Volga. . . . .                      | Passenger steamers. . . . .           | 84                        | 35  | 9,955  | 6                              | 14,808  | 43   | 2,197,991   |
|                                     | Goods and passenger steamers. . . . . | 109                       | 34  | 19,802   | —                              | —   | 75   | 5,308,669   |
|                                     | Goods steamers. . . . .               | 14                        | 1   | 116  | 4                              | 390,000   | 9  | 487,720   |
|                                     | Tug passenger . . . . .               | 67                        | 27  | 11,047   | 2                              | 8,400   | 38   | 1,556,212   |
|                                     | Tug steamers. . . . .                 | 646                       | 174   | 99,895   | 2                              | 22,000  | 470  | 25,016,500  |
|                                     | Chain cable steamers . . . . .        | 24                        | 14  | 3,582  | —                              | —   | 10   | 110,000   |
|                                     | Service . . . . .                     | 71                        | 15  | 1,267  | 16                             | 50,000  | 40   | 361,450   |
|                                     | Total. . . . .                        | 1,015                     | 300   | 145,664  | 30                             | 485,700   | 685  | 35,038,542  |
| Neva, with its lakes. . . . .       | Passenger . . . . .                   | 12                        | 2   | 1,380  | 10                             | 149,000   | —  | —   |
|                                     | Goods-passenger . . . . .             | 20                        | 5   | 2,173  | 15                             | 1,233,200   | —  | —   |
|                                     | Goods . . . . .                       | 1                         | —   | —  | 1                              | 13,400  | —  | —   |
|                                     | Tug passenger . . . . .               | 7                         | 5   | 1,463  | 2                              | 26,000  | —  | —   |
|                                     | Tugs. . . . .                         | 164                       | 84  | 24,689   | 80                             | 2,133,195   | —  | —   |
|                                     | Chain cable steamers . . . . .        | 2                         | 2   | 400  | —                              | —   | —  | —   |
|                                     | Service steamers . . . . .            | 13                        | 2   | 346  | 11                             | 90,200  | —  | —   |
|                                     | Total. . . . .                        | 219                       | 100   | 30,451   | 119                            | 2,634,995   | —  | —   |
| North Dvina. . . . .                | Total. . . . .                        | 90                        | 60  | 20,745   | 30                             | 410,620   | —  | —   |
| Dnieper and the south Bug . . . . . | Total. . . . .                        | 234                       | 80  | 21,481   | 152                            | 5,519,382   | 2  | 62,500  |
| Western Dvina . . . . .             | Total. . . . .                        | 59                        | 8   | 1,244  | 51                             | 1,219,025   | —  | —   |
| Niemen . . . . .                    | Total. . . . .                        | 11                        | 7   | 1,561  | 11                             | 21,700  | —  | —   |
| Vistula . . . . .                   | Total. . . . .                        | 24                        | —   | —  | 24                             | 403,500   | —  | —   |
| Don . . . . .                       | Total. . . . .                        | 139                       | —   | —  | 138                            | 5,123,464   | 1  | 12,000  |
| Dniester . . . . .                  | Total. . . . .                        | 11                        | —   | —  | 11                             | 411,377   | —  | —   |
| Narova . . . . .                    | Total. . . . .                        | 18                        | 15  | 1,673  | 3                              | 24,500  | —  | —   |
| Onega . . . . .                     | Total. . . . .                        | 4                         | 3   | 650  | 1                              | 10,000  | —  | —   |

| BASINS.   | IN 1890.                 | THE SORT AND QUANTITY OF FUEL USED BY STEAMERS. |                                |   |                                |  |   |  |
|---|--------------------------|---|--------------------------------|---|--------------------------------|--|---|--|
|   |                          | Total number of steamers.                       | Wood.                          |   | Pit coal.                      |  | Naphtha residues                          |  |
|   |                          |   | Number of steamers using wood. | Total quantity of wood used by steamers during one navigation, in cubic sagesnes. | Number of steamers using coal. | Total quantity of coal used by steamers during one navigation, in pounds | Number of steamers using naphtha residues | Total quantity of naphtha residue used by steamers during one navigation, in pounds. |
| By all the interior water ways of European Russia in 1890 . . | Passenger steamers . . . | 249   | 94                             | 20,956  | 111                            | 3,339,429  | 43  | 2,197,991  |
|   | Goods-passenger steamers | 179   | 49                             | 25,526  | 55                             | 2,746,468  | 75  | 5,308,669  |
|   | Goods steamers . . . . . | 80  | 1                              | 116   | 68                             | 2,787,891  | 11  | 550,220  |
|   | Tug passenger steamers . | 162   | 90                             | 35,486  | 31                             | 948,240  | 38  | 1,556,212  |
|   | Tugs steamers . . . . .  | 989   | 299                            | 135,351   | 219                            | 6,364,515  | 471                                       | 25,028,500   |
|   | Chain cable steamers . . | 26  | 16                             | 3,982   | —                              | —  | 10  | 110,000  |
|   | Service steamers . . . . | 140   | 24                             | 2,052   | 76                             | 1,077,720  | 40  | 361,450  |
|   | Total . . .              | 1,824   | 573                            | 223,469   | 563                            | 17,264,263   | 688                                       | 35,113,042   |
| In 1886 . . . . .   | Passenger steamers . . . | 167   | 77                             | 24,359  | 84                             | 1,397,042  | 6   | 235,200  |
|   | Goods-passenger steamers | 158   | 76                             | 45,321  | 42                             | 2,008,943  | 40  | 3,441,223  |
|   | Goods steamers . . . . . | 67  | 1                              | 116   | 60                             | 1,848,660  | 6   | 247,720  |
|   | Tug passenger steamers . | 153   | 97                             | 35,486  | 43                             | 703,500  | 13  | 739,875  |
|   | Tugs . . . . .           | 811   | 380                            | 178,896   | 187                            | 3,839,010  | 244                                       | 11,958,435   |
|   | Chain cable steamers . . | 26  | 26                             | 10,765  | —                              | —  | —   | —  |
|   | Service steamers . . . . | 125   | 35                             | 3,945   | 59                             | 505,145  | 31  | 449,000  |
|   | Total . . .              | 1,507   | 92                             | 298,888   | 475                            | 11,302,300   | 340                                       | 17,071,455   |

Wood fuel is only predominant in the basins of the Volga, North Dvina, Niemen, Narova and Onega. In the basins of the Vistula, Don and Dniester, steamers do not use wood fuel at all, but coal exclusively. The latter predominates also in the basins of the Neva, Dnieper, and Western Dvina; the Volga basin uses coal in very small quantities. In the above table the great predominance of the naphtha fuel may be observed. And in reality, by using the coefficients mentioned in the railway practice, it will be seen that the consumption of coal by steamers equals 172,643 cubic sagesnes of wood, and that of naphtha, 500,000 cubic sagesnes; and consequently, as the total quantity of fuel consumed amounts to 896,000 cubic sagesnes, liquid fuel forms 55.5 per cent; wood, 24.5; and pit coal, 20 per cent.

The Volga basin has the greatest trade importance; it uses 72 per cent of the total amount of fuel, and is nearly the only consumer of naphtha and its residues. By comparing the data of 1886 and of 1890, the following results will be obtained: the number of steamers consuming wood decreases from 692 to 573, and the quantity of wood, from 299,000 to 223,000 cubic sagesnes; the number of steam-

ers using coal increases from 475 to 563, that is, 16 per cent, and the consumption of coal augments from 11,302,000 to 17,264,000 pounds, that is, 52 per cent.; the number of steamers using naphtha doubles, from 340 to 688, and the quantity of fuel increases from 17,071,000 to 35,112,000 pounds.

It is very difficult to calculate the amount of fuel used by sea steamers, as the greatest part of the vessels going abroad use foreign coal. The consumption of coal in coasting navigations is never registered, and therefore data concerning this subject are very incomplete.

There is no doubt that the private, as well as the Government fleet on the Caspian Sea use no other fuel than naphtha residues, but the quantity consumed is quite unknown. Some idea of this amount, however, may be derived from the above mentioned data concerning the production of naphtha and the transport of its residues. Here follows some supplementary information.

In 1890, 57 steamers laden with naphtha navigated on the Caspian Sea, their total capacity being 1.6 million pounds; on the total they made 1,725 passages, transporting 69 million pounds, and consuming 2,873,000 pounds of naphtha residues as fuel. In the same year there were 284 sailing vessels; the steam and sailing vessels taken together made 3,505 navigations, and transported 112,000,000 pounds of naphtha residues. The Caucasus and Mercury Co., which has a large number of steamers on the Caspian Sea for conveying passengers between its ports, has consumed for the heating of these steamers 1,373,014 pounds of naphtha residues and 1,838 cubic sages of wood. But, besides the naphtha motor steamers and those of the above-mentioned company, there are on the Caspian many others, (goods, passenger and war steamers), heated with naphtha, and concerning which there are no data.

Thus, on the general total, there is much, though incomplete information concerning the consumption of fuel by different administrations, and by summing up all these data the following table comes out.

| LOCALITIES OF CONSUMPTION<br>OF FUEL IN 1890.                 | CONSUMPTION OF FUEL.           |                   |                   |                                  |  |
|---|--------------------------------|-------------------|-------------------|----------------------------------|--|
|   | Wood in<br>cubic sa-<br>genes. | Coal<br>in ponds. | Peat in<br>ponds. | Naphtha<br>residues<br>in ponds. | Total<br>quantity<br>of fuel ex-<br>pressed in<br>cubic sa-<br>genes of<br>wood. |
| Factories and works, not metal-<br>lurgical. . . . .          | 1,521,032                      | 162,803,062       | 45,813,100        | 35,526,440                       | 3,941,032  |
| Metallurgical works: iron, salt,<br>and naphtha . . . . .     | 924,898                        | 67,012,812        | 3,793,750         | 13,405,000                       | 1,833,018  |
| Railroads, besides the Trans-<br>caspian and Finland. . . . . | 604,536 *                      | 81,468,764        | 2,131,958         | 17,654,607                       | 1,685,224  |
| River steamers . . . . .                                      | 223,469                        | 17,264,263        | —                 | 35,113,042                       | 981,142  |
| Total. . . . .  | 3,273,927                      | 327,553,901       | 52,738,808        | 101,699,089                      | 6,440,366  |

\* Together with charcoal

Comparing these data with the before-mentioned on the production and consumption of coal, peat and naphtha, it will be found that, of the 460 million pouds of coal consumed in Russia in 1890, 328 millions, or 17 per cent, were used as fuel by factories, metallurgical works, railroads and river steamers, and the remaining quantity served for the heating of houses, sea-going steamers, and different administrations not included in the four above-mentioned rubrics. Peat was nearly all consumed by factories and railways, so that scarcely 10 per cent remained for the heating of house and other stoves.

The total consumption of naphtha residues will be nearly complete if thereto be added the total amount of this fuel used by the vessels of the Caspian fleet. Without going far wrong, it may be admitted that these vessels consumed 12,000,000 pouds; consequently the total amount of naphtha fuel used in Russia in 1890 would be 114,000,000 pouds.



## CHAPTER XXVII.

## Wages and working hours in factories.

THE annexed table contains data showing the wages paid to workmen in the 74 different manufactures, the most important in Russia. From this table it may be seen that the average annual earnings of a workman in Russia amount to 187.60 roubles, counting a year of 288 days, and a day of 12 hours. Besides, the greatest annual earnings are on the average 606 and the smallest, 88.50 roubles.

The average wages of workmen in the separate regions are very different. Thus, in the central region, including the Moscow, Vladimir, and their neighbouring governments, they amount to 167 roubles; in the Petrokovsk government, to 188; and in that of St. Petersburg, to 232 roubles a year. These earnings are still more unequal for the several manufactures existing in the same region, as may be seen from the following table.

| M A N U F A C T U R E S.      | R E G I O N S.  |                        |                            |
|-------------------------------|-----------------|------------------------|----------------------------|
|                               | Central region. | Petrokovsk government. | St. Petersburg government. |
|                               | R O U B L E S.  |                        |                            |
| Cotton manufacture . . . . .  | 166             | 187                    | 205                        |
| Woollen » . . . . .           | 160             | 188                    | 216                        |
| Flax » . . . . .              | 143             | 139                    | 148                        |
| Mechanic and machine. . . . . | 250             | 243                    | 362                        |
| Total average. . . . .        | 179             | 189                    | 232                        |

Over all the Empire, as well as in the separate manufacturing regions, the best wages are paid to workmen in steel and in machine factories, attaining on the

average 525 roubles a year. The smallest wages are in cotton spinning, wool weaving, flax weaving, dyeing, printing, and other like factories, where they range from 116 to 200 roubles yearly.

The labour of women and children is valued much lower than that of men. Generally, on the average, a woman gets about half, and a child one-third of the wages of a man; but sometimes the earnings of women and children differ considerably, dependent on the locality and on the kind of work they are employed in. In the tobacco manufactories, for example, a woman earns much more than one-half of what a man gets, namely, two-thirds; and children, not 33 per cent of man's wages, but 50 or even 60 per cent.

In order to have a clear idea of the dimensions of the workmen's wages, included in the table below, it is necessary to call attention to some peculiarities in the economical position of the Russian workman.

In Russia, which is principally an agricultural country, the great and small manufactories take their workmen from among the rural population. For the greater part workmen in Russian factories are at the same time landowners, who are not factory workmen by profession; the wages they earn in factories are not their only means of existence, but are only accessory to what they get by their agricultural labours. The workman loves his land, and does not like to leave it permanently for the factory; he has, therefore, continual intercourse with his village, and goes there yearly to see his relatives and neighbours, and still more to cultivate his own little farm. Therefore, the life of the Russian workman is quite different from that of the workman abroad. Thus, having his own land he is more independent in signing a contract with his master, and can demand higher wages than if he had no land and no home. It is true, there are cases when he does not profit by his independent economic position, but that happens seldom, and depends on the greater or smaller welfare of the peasant. Nevertheless, in making a contract with the manufacturer, he always has in view that, in case of failure, he can always return to his village, where he will get board and lodging. The foregoing explains why, in the manufacturing localities of central Russia, the wages change regularly twice a year; in spring and in summer they are 10 to 20 per cent higher than in autumn and winter. This occurs, as said above, because in spring many workmen return to their villages for field labour, and therefore in factories hands become scarce. The term of service of the Russian workman also depends upon the same circumstance. In the Moscow, Vladimir, and other governments of Central Russia, the workmen are generally hired from the 1st of October, when all field works are ended, until Easter, when such labours commence, or from Easter until the first of October.

Being an agriculturist by nature, and considering farm work to be the principal kind of labour, the Russian workman seldom tries to perfect himself in any other industry, and seldom chooses other occupations. This fact, of course, has a bad influence on his earnings; but on the other hand, in case of need, he finds a place more easily in some factory, than if he only knew some special industry, so much the more so that, having great natural capacity, he easily adapts himself to the technic of one or another industry. He therefore frequently, dependent on circumstances, works first at one factory, then at another, even if the two have nothing in common; thus, for example, he first serves in a cotton mill, and then he goes to



a glass factory. Owing to this fact, a contemporary French investigator of trade in Russia called the Russian workman *un ouvrier temporaire*, (temporary workman), *un nomade industriel*, (an industrial nomad). Exceptions are formed first of all by such workmen, who together with their parents begin from childhood to work in factories, and passing from simple to more complicated work obtain, when of age, not only knowledge but also dexterity, and thus become skilled in their respective trades. Next come such workmen as, when children, are sent from villages to towns to learn a trade; or such who, besides agriculture, practise different household industries, as for example, weavers, matting makers, locksmiths, and workers in china. Finally, workmen in such industries, the special knowledge of which gives a man the possibility to open with very little means his own small workshop, are workers in the wood and metal industries. All such men are specialists, and shun work in such factories as do not correspond to their speciality, finding it unprofitable or undesirable. These workmen generally serve, in small and large factories, under foremen. Moreover, a great number of workmen consists of the town inhabitants of both sexes, who have no land of their own, and very often no home.

Thus, in speaking of the earnings of a Russian factory man, it is also necessary to mention those profits which he gains as an agriculturist.

Again, the Russian workman spends very little of the money he earns, for food, lodging, and dress, as compared with those of other countries. Coming from the village he is very modest in his demands. His food is very simple, although abundant, and answers his tastes. It consists of *shi*, (cabbage soup), and meat, and some gruel with linseed oil, for dinner and supper; and for luncheon he drinks tea with black (rye) bread. On fast days he eats fish and vegetables instead of meat; his principal and favourite beverage is *kvas*. This food costs the workman still less, as in many factories sugar and tea are furnished to them by their masters. As the factory owners get these articles in large quantities, they buy them very cheap and of fair quality.

In Moscow, for example, the board of a workman comes to 4.50 or 5 roubles a month, or 54 to 60 roubles a year. But for the most part, both in town and village factories, the workmen board at their own expense. In order to reduce the cost they form associations, or clubs, called *artels*, and board together. An *artel* is generally formed either of workmen from the same village, or of the same factory section; they choose a chief from among themselves, who has to arrange all the affairs of the club; besides, they have several members authorized to control the chief, called the *starosta*. This latter buys provision, engages a cook, keeps the accounts, and calculates what each member of the *artel* has to pay. The accounts are then presented to the Administration of the factory, who pays them out of the earnings of the workmen. The Administration furnishes the *artel* with a kitchen, fuel, water and an eating room free, costing the factory about 2 kopecks per workman. Owing to such organizations the workmen receive cheap and good food. Of course, the boarding expenses are not uniform, and depend largely upon what the workmen, forming an *artel*, earn. There are workmen that earn 60 roubles a month, and which allow themselves more dainty food, but even then their board does not come dearer than seven or eight roubles a month each.

In many factories there are provisions stores kept by societies formed of the work-

men themselves. In such shops the workmen not only get all provisions at the market price, but even have a dividend of 3 to 6 per cent. Unfortunately there are very few such shops, kept by the workmen themselves; but instead, in all large factories which are out of town, there are shops, which by the quantity and variety of their goods, are no worse than groceries in the capitals. Here every workman has the right to take on credit, on account of his earnings, all that he wants, up to a certain limit; the price of the goods is the same as in the markets, and sometimes even lower. The workman is not bound to buy every thing he needs in the shops annexed to the factories; he can, if he likes, get things in other shops, but he avoids doing so; and the best proof of that is, that as soon as an *artel* shop is opened in connection with a factory, all the other shops in the neighbourhood begin to close little by little, as all their customers, principally workmen in factories, fall off.

Moreover, with the permission of the administration, weekly bazaars are organized in the factories. To such bazaars the local peasants bring flour, potatoes, cabbage, and other produce, so that the workmen can get cheap and good foodstuffs for a long time.

As to lodging, the Russian workman is also generally well provided. In nearly all large factories there are buildings specially constructed for lodging the workmen. Here they get lodging with fuel and lighting, sometimes free, or at a very low price, depending on the type of the building, the dimensions of the lodging, and the number of rooms. Russian factories have three types of building for lodging workmen. The first has the character of barracks. In enormous buildings, many stories high, large, light, and well ventilated halls are constructed, each containing either hammocks, or bedsteads with mattresses and pillows filled with straw. Married men, bachelors, girls and widows sleep in separate halls. There is a general kitchen, and a dining room in the building. The second type consists of buildings with lodgings. Here each story is generally divided by a corridor, on both sides of which are small rooms for families of 3 to 5 members. There are no dining rooms in such buildings, as the workmen eat in their own rooms; in each story there is a kitchen, and in it an enormous stove, which extends through all the stories, and has many cooking stoves. In the kitchen, or in a separate room, a kettle with boiling water is fixed for tea, or other needs of the workmen. The bedsteads, bedding and all the furniture, the workmen must furnish themselves, and they must light their own rooms. The factory administration only heats the house, and lights the staircase, corridors, and kitchens.

Finally, the third type of habitation the most in favour with workmen, but unfortunately very little developed in Russia, consists of separate stone or wooden small houses, containing from two to four lodgings each, and having separate staircases. Each house has a small yard, necessary out buildings, a garden, and a kitchen garden. As has been already mentioned the prices of lodgings vary greatly. Those in the buildings of the first type are much cheaper, than in the two others. But, in general, a lodging, together with the heating of it, costs a workman from 0.50 to 3 roubles a month, or from 6 to 36 roubles a year.

The Russian workman prizes above every thing a lodging provided by his master. Such lodgings are not only cheaper, but their price does not fluctuate, as is the case with private lodgings; furthermore, the workman has not to buy wood if

his lodging is furnished him, and that fact is of great value to him, owing to the winters being so long and cold in Russia. It happens very often that just at the time when wages fall, owing to the excess of the number of workmen over the demand, the prices of private lodgings are raised. Again, private lodgings are for the most part far from being in a good sanitary condition. Thus, of two factories, one of which has a building with lodgings for workmen and the other has none, the workmen generally prefer to serve in the former. This circumstance is well known by the Russian manufacturers, and therefore they all try to have ready lodgings for their employees, as otherwise they would sometimes suffer from the inability to secure good workmen.

Moreover, every large factory, situated out of town, has a hospital, that being ordered by the law, a bath, a school, a library with a reading-room; and some very well organized factories have, besides, almshouses for old workmen; and for babies. infant schools, and other charitable institutions. The workmen have the use of all this gratis, an important circumstance which must be taken into consideration in examining the question of wages.

In Russia, as in other countries, the workman is paid either by piece, as defined in the contract, the time for the fulfillment of that work being fixed by the workman, conformably to the regulations of the factory; or he is paid for time-work according to his ability; but the former is most general method of payment, the so-called *sdelnaia plata*, that is, payment by the piece. In a few manufactures, as for example machine construction, wages are paid to a whole *artel*, or workman's association, after a certain amount of work is completed. Formerly, the workmen always received daily or monthly wages, but now that method is only practised where the *sdelnaia plata* cannot be adapted.

In examining the amount of wages paid to workmen in Russia, it is necessary to see not only if they answer all the requirements of the workmen, but also if they really receive the wages agreed upon; to see if their earnings are not reduced in some way by the masters, unbeknown to the workmen. It is true, there was a time when the factory workman did not receive the full pay due to him for his labour, owing to different misusages on the part of his master. Thus, for example, the money was paid at indefinite periods; often the workmen waited some months for their wages. and during that time in order to exist had to borrow money, sometimes at large percentage, or else take on credit the things they most had need of, thus falling into debt. The arbitrary method of fining the workmen for laziness, breach of order, inexactitude in their work, and in fixing the amount of that fine, attained owing to the fact that there was no law to restrain it such extreme limits that the workman often received but one-third of his contract money. Such useful institutions as shops for workmen were only means, in the hands of some masters, of getting money from the workmen. The dismissing of workmen without any cause occurred very often. There were cases where the manufacturer lowered the wages of his workmen before the term was up, by decreasing the number of working days or hours, and paying accordingly.

All such arbitrary methods and misusages were stopped by a special law. published in 1886, touching «the mutual relation between the manufacturers and their workmen, and the inspection of different works and manufactories.» This law,

formed by a special commission in which the manufacturers took an active participation, is justly called by some foreign investigators of the Russian factories «a real humane reform which shows the solicitude of the Russian Imperial Government towards the working classes.» In it are precisely and clearly defined the mutual, profitable relations between the masters and their workmen; furthermore, special administrations for the inspection of factories, and for controlling the fulfillment of the contracts between the employer and his men, are organized. Thus, according to the 97th clause of this law, the manufacturers must have written contracts with their workmen; such a contract must be in the form of an account book, according to a sample confirmed by the Local Inspection. This book, which must be kept exclusively by the workman, contains: the term of the hire; the amount of wages; when and how they are to be paid; how much the workman has to pay for the lodging he has in the factory; all the fines imposed on the workman and the causes thereof; all other conditions which the parties will find necessary to inscribe in the book; finally, this book contains extracts of the law, and also regulations concerning the rights, duties, and responsibilities of the workman. These regulations, according to the law, must be composed by the administration of the factory, and sanctioned by the local Inspection; they must contain, according to the 142nd clause of the Statute, amongst other things, a separate description, for grown up workmen and for children, of the hours when the work is to commence, and at what o'clock to finish; how often and how long the workmen have a right to interrupt the work for resting, lunching and dining; at what o'clock they finish working on Saturdays and the evenings of holidays; what holidays they do not work at all, and the like. Furthermore, the manufacturer is bound to present to the Inspection for sanction a detailed valuation of the workmen's labour; such lists must be hung up in the workshops. Besides, it is strictly forbidden, according to clause 101 of the Statute, before the term of the workman is up, or without a fortnight's notice, if he is hired for no definite term, to lessen his earnings either by publishing a new list of wages, or by decreasing the number of working days or hours, or by any other means. It is also strictly forbidden, clause 104, under the penalty of a severe punishment, to pay the workmen, instead of money, in coupons, bread, wares, or other like values. This clause existed also in the former statute, but in the law of June 3, 1886, it is confirmed in greater detail, the punishment for the breaking of this law being made still more severe.

Clause 102 of the Statute defines the time when the money is to be paid to the workmen, dependent on the circumstance, whether they are hired for a certain or an uncertain period. In the first case, the money must be paid at any rate once a month; and in the second, not less than twice a month. The statute also enumerates all the reasons for which both parties can break the contract made between them, before the term is up; also cases, when the factory owner can dismiss a workman; in the latter instance the workman has always the right to complain to the magistrate, and if his complaint is considered just, the manufacturer has to pay him all his losses. According to the law of June 3, 1886, the manufacturer has the right to impose fines on his workmen; but in the first place, such penalties must have a true disciplinary character, and not serve as indemnification for the damages done by the workman; in the latter case the manufacturer has a right to complain to the magistrate; secondly, the law defines the circumstances under which the owner has the

right to impose a fine on the workman, as also the dimensions of such a fine; and thirdly, all these fines are transformed into a special capital, which is used, with the sanction of the factory Inspector, exclusively for supplying the needs of the workmen themselves. This humane measure, which deprives the manufacturers of the temptation to impose fines on workmen for their own profit, was proposed by the manufacturers themselves, who took part in the making of the law of June 3, 1886.

Shops for selling to workmen the objects of first necessity can be annexed to factories only with the sanction of the factory Inspection, which is obliged to see that the goods are sold to the workmen at the market price, and that they are of good quality. Therefore, the factory Administration is bound to present, from time to time, to the Inspection the price lists of the wares on sale; such a list, confirmed by the Inspection, must be exhibited in the shop for the benefit of workmen.

For the breach of all these regulations, as well as of others established by the law of June 3, 1886, special penalties are imposed. Thus, for example, if the manufacturer lowers the wages of the workmen in any way whatever before the term is up, or without at least a fortnight's warning, or if he pays them, instead of money, in coupons, wares, bread, or other articles, he is fined for the first and second offences, from 100 to 300 roubles; the third time, or even the first and second if only the circumstance has caused an agitation among the workmen, accompanied by disorders, especially if for putting an end to the latter extreme measures have to be taken, the manufacturer is arrested for three months and sometimes even deprived of the right of running a factory.

As has been already mentioned the duty of seeing that the law of June 3, 1886, is fulfilled was imposed by the same law on the factory Inspection. This latter was established in 1882, and annexed to the Ministry of Finance; its aim is to see that the law concerning young workmen is fulfilled. Later on, the number of persons forming this Inspection was increased. Besides, in each of the governments where this law was introduced, special administrations, bearing the character of a Court of Justice, and called Factory Councils, were established. The latter, the personal composition of which fully guarantees good judgment and impartiality in deciding different affairs\*, consider the protocols made by the members of the Inspection concerning the breach of regulations in factories, and impose fines on the culprits in dimensions as fixed by law; these fines, not exceeding 100 roubles, cannot be complained against to the magistrates. For such deeds as merit the forfeiture of liberty and of certain rights, the culprits are judged by the Court of Justice. Furthermore, the Councils have a right to establish regulations concerning measures to be taken for guarding the life, health, and morals of the workmen, as also concerning medical aid. Similar regulations have the same force as a law, in factories and works of a given region.

\* Each Factory Council consists of the chief of the government, who is the President, and of the following members: the local factory inspector, the procurator of the district Court of Justice, the chief of gendarmes, and two representatives from the factory. Besides, in the sessions, can take part the medical inspector of the government, the government engineer, architect and mechanic, as also other persons from whom useful information and explanations concerning the matter under examination may be derived.

The principal executor of the law of June 3, 1886, as well as of other regulations, concerning factories and works, is the Factory Inspection, with a principal Inspector at its head.

Besides the duty of carrying out all regulations concerning children, and minor workmen of both sexes and working women, the Inspection is bound: to see that the manufacturers and workmen observe all the rules concerning their duties and mutual relations; to introduce measures and rules established by the Councils, and to see that they are observed; to examine and confirm the table expenses, the list of fines, the rules to be observed by the workmen for introducing order in the factories, the valuation of labour; and principally to take measures for preventing disputes and misunderstandings between the manufacturers and their workmen, by examining on the spot such misunderstandings, and bringing the parties to an amicable agreement. The principal Inspector must direct and assimilate the activity of the members of the district Inspection, and see that they fulfil their duties. The factory Councils, when they notice that a member of the Inspection does not act as he should, report accordingly to the Inspector, who either himself takes measures to arrange matters, or communicates the affair to the Ministry of Finance.

An experience of seven years has shown how well-timed and expedient was the law of June 3, 1886. Owing to the energy and impartiality of the members of the Inspection, and to the confidence which the manufacturers and workmen have in them, and also owing to the severity of the Councils, the said law is punctually fulfilled, and together with it more rational relations between the manufacturers and workmen are established. An important fact is that those abnormal conditions in the lives of the factory workman, which formerly had such a bad influence on his pecuniary circumstances, and especially on his wages, are nearly done away with. Thus, for example, in 1886 many manufacturers quite gave up the practice of fining their employees, without damaging in the least, as they themselves acknowledged, the quality and regularity of the work. In other factories the fine existed, but its dimensions formed but one-half or one-third of those of former years; the custom was continued only as a disciplinary measure, and its limits were established by law.

Thus, the above question, whether the earnings of the workman are decreased without his consent in consequence of his unequal relations with his master, can be answered negatively. Of course, even now, as everywhere, there are manufacturers who transgress the law, but they form an exception, and their number decreases every year, owing to the vigilance of the Inspection.

It is now time to examine the second subject of the present article, which is so closely connected with the first, and which treats of the number of the working hours per day in Russian works and factories.

About ten years ago the Russian manufacturers had the right to make their workmen of different ages and sexes work all the year round, not excepting Sundays and holidays, and at all hours of the day and night. Children, 6 or 7 years old, young lads, girls and women, all worked as much and as long as the men. But in the eighties the Government found it necessary, following the example of the Western European countries, to protect the youth working in factories. In 1882 a law, completed in 1884 and in 1890, was published, which absolutely prohibited

the employment of children under 12 in factories; children from 12 to 15 are allowed to work only in the day time, and that not more than eight hours, with a rest-hour after four hours of work, or else six hours only without any rest. The night hours, in which children between 12 and 15 years are not permitted to work, are defined according to law to be from 9 o'clock in evening to 5 o'clock in the morning. Furthermore, no work can be demanded of them on holidays, Sundays and high feast days. On such days children can work only on extreme occasions, as an exception, and then even every time it must be sanctioned by the local powers. Simultaneously with this law, the Factory Inspection, as has been already mentioned, was organized.

In 1884 the manufacturers of the government of St. Petersburg raised the question concerning the necessity of prohibiting by law night work for workmen of all categories, and in all factories except those which work such productions as do not allow of interruption. However, the Government did not find it the time to fully satisfy the demand of the St. Petersburg manufacturers, as those of the other localities in Russia made vigorous protests against the proposition. Therefore, night work was prohibited only to workmen of certain categories and in special factories, namely: in 1885 a law was established, confirmed in 1886, which prohibited night working to lads and girls from 15 to 17 years old inclusively, as well as to grown-up women, in cotton mills, wool, flax and tissue factories, that is, in such establishments where women work most, forming 77 per cent of women working in other factories. Besides, through the intercession of the manufacturers of central Russia, the working day is increased by two hours, as compared to what was established by the law of 1882 for minor workmen; the night was thus diminished by 2 hours also, being fixed from 10 to 4 o'clock in the morning.

Such a modification of the law of June 1, 1882, was made with the aim of giving the minor workmen and women the possibility of working not 8 hours in each relay, as was before the case, but nine hours a day.

As to adult workmen, they are allowed until now to work any hour of the day or night, all the year round, as they please. They generally work twelve hours out of the 24, either without interruption, which happens however seldom, or with a rest after six hours work, but with such a calculation that the same workmen should not work two nights running.

It must be, however, observed that there are few factories in Russia, not more than 20 per cent, in which work is going on all the 24 hours; to such belong factories which have to work without interruption, *à feu continu*, as for instance, glass works. In some manufacturing regions, as for example in the St. Petersburg and its neighbouring governments, as well as in the Baltic and Vistula provinces, working 24 hours a day exists only as an exception. Day and night work is principally practised in factories of central Russia, in the governments of Moscow, Vladimir and others; but even there work at night is considered a heavy burden, both on the manufacturers and on the workmen. Therefore, the question of exterminating night work over all Russia, and for all classes of workmen, either by law or by mutual agreement between the manufacturer and the employee, is only a question of time, and without doubt not far distant.

The predominating type of work in Russia, as has already been mentioned, is

day work. But a great difference is observed in the duration of the working day, and in the number of working hours, not only in the separate localities of Russia and in different productions, but even in factories of the same locality and occupied in the same production. This difference, in some cases amounts to 10 hours a day; thus, in some factories of the same class, a working day lasts 18 hours, and in others, only 8 hours. In the same way a great difference is noticed in the time when the work begins and ends, as may be seen from the following table.

| BEGINNING OF<br>A WORK DAY. | END OF A<br>WORK DAY.     | DURATION<br>OF A<br>WORK DAY | BEGINNING OF<br>A WORK DAY. | END OF A<br>WORK DAY.    | DURATION<br>OF A<br>WORK DAY. |
|-----------------------------|---------------------------|------------------------------|-----------------------------|--------------------------|-------------------------------|
| At<br>4 o'clock morning.    | At<br>10 o'clock evening. | 18 hours.                    | At<br>7 o'clock morning.    | At<br>7 o'clock evening. | 12 hours.                     |
| 5 » »                       | 5 » »                     | 12 »                         | 7 » »                       | 8 » »                    | 13 »                          |
| 5 » »                       | 6 » »                     | 13 »                         | 7 » »                       | 9 » »                    | 14 »                          |
| 5 » »                       | 7 » »                     | 14 »                         | 8 » »                       | 5 » »                    | 9 »                           |
| 5 » »                       | 8 » »                     | 15 »                         | 8 » »                       | 6 » »                    | 10 »                          |
| 6 » »                       | 4 » »                     | 10 »                         | 8 » »                       | 7 » »                    | 11 »                          |
| 6 » »                       | 5 » »                     | 11 »                         | 8 » »                       | 8 » »                    | 12 »                          |
| 6 » »                       | 6 » »                     | 12 »                         | 8 » »                       | 9 » »                    | 13 »                          |
| 6 » »                       | 7 » »                     | 13 »                         | 9 » »                       | 5 » »                    | 8 »                           |
| 6 » »                       | 8 » »                     | 14 »                         | 9 » »                       | 6 » »                    | 9 »                           |
| 6 » »                       | 9 » »                     | 15 »                         | 9 » »                       | 7 » »                    | 10 »                          |
| 7 » »                       | 4 » »                     | 9 »                          | 9 » »                       | 8 » »                    | 11 »                          |
| 7 » »                       | 5 » »                     | 10 »                         | 9 » »                       | 9 » »                    | 12 »                          |
| 7 » »                       | 6 » »                     | 11 »                         | 10 » »                      | 9 » »                    | 11 »                          |

In general, Russian factories in which the working day begins not earlier than 5 o'clock in the morning and does not end later than 9 o'clock in the evening, form 74 per cent; of these the greater number of factories begin their work not at 5 o'clock, but at six and later, to 10 o'clock inclusively, and finish not at 9 but much earlier, at 4 o'clock in the afternoon.

The Russian factories present a great variety as to the number of working hours per day. In some cases the men work 14 to 15 hours a day, and in others only 6, and that with considerable interruptions; the latter case occurs in such factories the production of which is prejudicial to the workmen, as for example, the manufacture of white lead. In any case there are very few factories where the men work more than 12 hours a day, their number forming only 20 per cent, and such factories where the work does not exceed 12 hours, 80 per cent. Of the latter, factories having 12 hours work a day form 36.8 per cent; 11 hours, 20.8 per cent; 10 hours, 18.1 per cent; 9 hours, 2.1 per cent; 8 hours, 1.6 per cent; 7 hours, 0.4



per cent; and 6 hours, 0.2 per cent. Twelve hours work is practised in those factories where the working day lasts  $13\frac{1}{2}$  hours, of which  $1\frac{1}{2}$  hours are given the workmen for meals. There are, however, factories where the working day lasts also  $13\frac{1}{2}$  hours, and the men work only 10 or 11 hours, having  $2\frac{1}{2}$  or  $3\frac{1}{2}$  hours given them for their meals.

It must however, be observed that since the publishing of the law which prohibits women and minors of both sexes to work at night, owners of such factories which were influenced by this law, have a tendency to organize the working hours in such a way that, instead of the working day lasting  $13\frac{1}{2}$  hours, it should last 18. and that two relays of workmen should work nine hours each. This is influenced, on the one hand, by a natural desire of the manufacturer to distribute equally between the working men, women and minors, the number of working hours; and on the other, by the fact that, in thus distributing the time, the owner has the possibility, without great expense, to increase or decrease the production, according to circumstances. Thus, for example, if he possesses in his weaving factory 500 looms, he can have 1,000 workmen weaving on them in two parties of 500, 9 hours at a time. If, in case of need, he wishes to reduce the production, he has only to dismiss half of his workmen, and with the rest to work 12 hours a day, on the same looms and in the same apartments.

More detailed information concerning the wages paid to workmen of different categories, and on various factories, may be had from the next Chapter.



CHAPTER XXVIII.

Data showing the wages paid to workmen in factories.

| I.   |                   |   |        | Maximum. Minimum.    |                   |
|--|-------------------|---|--------|----------------------|-------------------|
| COTTON MANUFACTURE.  |                   |   |        | Roubles.             |                   |
| The yearly average earnings of a workman amount to 157.83 roubles. |                   |   |        | Locksmiths . . . . . | 42 8              |
|  | Maximum. Minimum. |   |        | Blacksmiths. . . . . | 35 10             |
|  | Roubles.          |   |        | Hammer men . . . . . | 20 10             |
|  |                   |   |        | Carpenters . . . . . | 30 24             |
| Fluctuations . . . . .   | 220 112.32        |   |        | II.                  |                   |
| The monthly earnings of:   |                   | COTTON-WEAVING INDUSTRY.                      |        |                      |                   |
| Sorters . . . . .  | 19 5.75           | The yearly average earnings of a workman is . |        | 174.98 roubles       |                   |
| Cotton peelers . . . . .   | 26.4 6.4          |   |        |                      | Maximum. Minimum. |
| Spreaders . . . . .  | 16.5 6.24         |   |        |                      | Roubles.          |
| Combers . . . . .  | 38 12             | Fluctuations . . . . .                        | 253.44 | 127.9                |                   |
| Linen cloth makers . . . . .                                       | 15.5 6.40         | Monthly earnings of:                          |        |                      |                   |
| Bolt makers . . . . .  | 26.4 8.5          | Weavers, man or woman                         | 33.60  | 4.5                  |                   |
| Frame tenders . . . . .  | 18.75 5.20        | Overseers of weavers . . . . .                | 55     | 14.5                 |                   |
| Ribbon makers . . . . .  | 16.5 6            | Warpers . . . . .                             | 24     | 9.85                 |                   |
| Spinners . . . . .   | 48 13             | Yarn winders . . . . .                        | 20     | 4.25                 |                   |
| Doffers . . . . .  | 16 8.4            | Sizers . . . . .                              | 41.30  | 11.80                |                   |
| Twisters . . . . .   | 18 8              | Binders . . . . .                             | 26     | 9                    |                   |
| Creelers . . . . .   | 15 5.5            | Sorters . . . . .                             | 23.5   | 7                    |                   |
| Frame tenders . . . . .  | 28.8 5            | Aids . . . . .                                | 14.5   | 2.10                 |                   |
| Winders of yarn on reels   | 19.2 6            | Slay makers. . . . .                          | 33.40  | 17.90                |                   |
| Aids of a frame spinner  | 55 20             | Rejecters of goods . . . . .                  | 34     | 9.2                  |                   |
| Winders of yarn on bobbins . . . . .                               | 24 8              | Locksmiths and turners . . . . .              | 42     | 12.5                 |                   |
| Machinists . . . . .   | 75 24             | Blacksmiths . . . . .                         | 32     | 14.8                 |                   |
| Steam mechanics . . . . .  | 30 15             | Hammerers . . . . .                           | 20     | 9.15                 |                   |
| Gas lighters . . . . .   | 26 20             | Steam mechanics . . . . .                     | 75     | 15.5                 |                   |
|  |                   | Stockers . . . . .                            | 24     | 10                   |                   |

\* The minimum wages are paid to new workmen, as also to women and children. The difference of the pay depends on the various localities, sometimes on the season, and on other conditions. When the pay is per piece, as is the case in many manufactories, the weekly average earnings are calculated according to the greatest amount of work which can be possibly done.

## III.

## COTTON-SPINNING AND WEAVING INDUSTRIES.

The yearly average earning of each workman amounts to . . . . . 152.88 roubles

|  | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|--|----------------------|----------------------|
| Fluctuations . . . . .                     | 201.5                | 120.9                |
| Monthly earnings of:                       |                      |                      |
| Overseer in the weaving section . . . . .  | 55                   | 17                   |
| Overseer in the spinning section . . . . . | 56.4                 | 15                   |
| Weaver, man or woman . . . . .             | 33.60                | 7                    |
| Spinners . . . . .                         | 42.25                | 12                   |
| Sorters . . . . .                          | 25                   | 5                    |
| Peelers . . . . .                          | 25                   | 5                    |
| Sharpeners . . . . .                       | 21                   | 8.7                  |
| Combers . . . . .                          | 19                   | 7.2                  |
| Linen cloth-makers . . . . .               | 15                   | 5.5                  |
| Ribbon makers . . . . .                    | 16.90                | 5.3                  |
| Frame tenders . . . . .                    | 19                   | 5.3                  |
| Doffers . . . . .                          | 16.7                 | 5                    |
| Twisters together . . . . .                | 18                   | 8                    |
| Creelers . . . . .                         | 16.5                 | 5                    |
| Smoothers . . . . .                        | 17.60                | 5                    |
| Frame tenders . . . . .                    | 20                   | 5.25                 |
| Twisters . . . . .                         | 24.15                | 4.32                 |
| Winders . . . . .                          | 19.8                 | 4.15                 |
| Warpers . . . . .                          | 23.90                | 7.5                  |
| Drawers-in . . . . .                       | 24                   | 4.5                  |
| Sizers . . . . .                           | 41.30                | 12                   |
| Binders . . . . .                          | 27                   | 7.50                 |
| Slay makers . . . . .                      | 36                   | 8                    |
| Rejecters of goods . . . . .               | 35                   | 9                    |
| Packers . . . . .                          | 24                   | 8                    |
| Smiths . . . . .                           | 42                   | 6                    |
| Blacksmiths . . . . .                      | 37                   | 8                    |
| Hammerers . . . . .                        | 21.6                 | 8                    |
| Steam mechanics . . . . .                  | 75                   | 12                   |
| Gas lighters . . . . .                     | 27                   | 10                   |
| Simple workmen . . . . .                   | 20                   | 6                    |

## IV.

## THE DYEING, WHITENING, STARCHING, AND PRINTING OF TISSUES.

The yearly average earning of each workman amounts to 192 roubles

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 241.92               | 156                  |
| Monthly wages of:      |                      |                      |
| Whiteners . . . . .    | 16.8                 | 13                   |

Maximum. Minimum.  
Roubles.

|                          |       |     |
|--------------------------|-------|-----|
| Dyers . . . . .          | 20.4  | 12  |
| Printers . . . . .       | 24    | 14  |
| Teasellers . . . . .     | 20.60 | 20  |
| Simple workmen . . . . . | 12    | 6.5 |

## V.

## THE MANUFACTURE OF CHEINTZ AND KERCHIEFS, AND THE DYEING OF COTTON TISSUES.

The yearly average earning of a workman amounts to 180 roubles

|                                   | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------------------|----------------------|----------------------|
| Fluctuations . . . . .            | —                    | —                    |
| Monthly wages of:                 |                      |                      |
| Printers . . . . .                | 33                   | 6.10                 |
| Drawers . . . . .                 | 120                  | 4                    |
| Engravers . . . . .               | 80                   | 10.5                 |
| Whiteners . . . . .               | 36.5                 | 5.36                 |
| Dyers . . . . .                   | 31                   | 5                    |
| Indigo dyers . . . . .            | 18.5                 | 5                    |
| Calendriers . . . . .             | 25                   | 6                    |
| Steamers . . . . .                | 29.3                 | 6                    |
| Packers . . . . .                 | 22                   | 6.30                 |
| Calico printers . . . . .         | 105                  | 12                   |
| Starchers . . . . .               | 14                   | 6.5                  |
| Pressers . . . . .                | 42                   | 7                    |
| Rollers . . . . .                 | 35                   | 19.5                 |
| Mechanicians . . . . .            | 70                   | 4                    |
| Joiners and carpenters . . . . .  | 40                   | 15                   |
| Chemists (Laboratorists). . . . . | 35                   | 6                    |

## VI.

## TAPE, GALLOON, LACE AND TRIMMING MANUFACTORIES.

The yearly average earnings of a workman amount to 171.6 roubles.

|                             | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------------|----------------------|----------------------|
| Fluctuations . . . . .      | 273                  | 160                  |
| Monthly wages of:           |                      |                      |
| Weavers . . . . .           | 65                   | 13                   |
| Warpers . . . . .           | 25                   | 17                   |
| Beelers . . . . .           | 12                   | 6                    |
| Spoolers . . . . .          | 16.5                 | 5                    |
| Winders . . . . .           | 21                   | 6.5                  |
| Finishers . . . . .         | 18.5                 | 8.70                 |
| Affixers of seals . . . . . | 6.25                 | 3.75                 |
| Dyers . . . . .             | 22.5                 | 13.5                 |
| Machinists . . . . .        | 55                   | 16                   |

VII.

TULLE MANUFACTORY.

The yearly average earnings of a workman amount to . . . . . 235.30 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 235.3                | —                    |
| Monthly wages of:      |                      |                      |
| Weavers . . . . .      | 65                   | 30                   |
| Darners . . . . .      | 22                   | 6.5                  |
| Trimmers . . . . .     | 17.30                | 10.2                 |
| Spoolers . . . . .     | 17.30                | 6.5                  |

VIII.

WOOL-SPINNING AND WOOL-COMBING MANUFACTORIES.

The yearly average earnings of a workman amount to . . . . . 190.56 roubles.

|                                 | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|---------------------------------|----------------------|----------------------|
| Fluctuations . . . . .          | 239                  | 152.64               |
| Monthly wages of:               |                      |                      |
| Peelers . . . . .               | 24                   | 10                   |
| Combers . . . . .               | 20.20                | 10                   |
| Cleaners . . . . .              | 26.40                | 10                   |
| Spinners . . . . .              | 39                   | 24                   |
| Twisters . . . . .              | 13.2                 | 7.20                 |
| Winders . . . . .               | 21.6                 | 10                   |
| Aids . . . . .                  | 15.6                 | 12                   |
| Packers . . . . .               | 25                   | 9.20                 |
| Black- and locksmiths . . . . . | 60                   | 32                   |

IX.

SPINNING OF VIGOGNE WOOL.

The yearly average earnings of a workman amount to . . . . . 139.18 roubles.

|                             | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------------|----------------------|----------------------|
| Fluctuations . . . . .      | 218.88               | 106.56               |
| Monthly wages of:           |                      |                      |
| Sorters . . . . .           | 27                   | 7.6                  |
| Combers . . . . .           | 20.60                | 12                   |
| Cleaners . . . . .          | 24                   | 16                   |
| Spinners . . . . .          | 29                   | 11                   |
| Twisters . . . . .          | 18.70                | 8                    |
| Twisters together . . . . . | 12.5                 | 8                    |
| Winders . . . . .           | 14.50                | 8.40                 |
| Dyers . . . . .             | 20.60                | 11                   |
| Packers . . . . .           | 17                   | 9.80                 |
| Aids . . . . .              | 5.5                  | 4                    |

X.

SPINNING OF CARDED WOOL (WORSTED).

The yearly average earnings of a workman amount to 156.71 roubles.

|                             | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------------|----------------------|----------------------|
| Fluctuations . . . . .      | 178.56               | 129.60               |
| Monthly wages of:           |                      |                      |
| Sorters . . . . .           | 35.20                | 14.40                |
| Spinners . . . . .          | 38.40                | 28.80                |
| Combers . . . . .           | 20.20                | 13.20                |
| Twisters together . . . . . | 13.20                | 7.20                 |
| Twisters . . . . .          | 18.20                | 10.80                |
| Winders . . . . .           | 18                   | 7.20                 |
| Aids . . . . .              | 19                   | 10.80                |
| Washers . . . . .           | 20.40                | 12                   |
| Repairers . . . . .         | 21.60                | 16.80                |
| Dyers . . . . .             | 20.40                | 16                   |
| Packers . . . . .           | 21                   | 7.20                 |

XI.

SPINNING OF ARTIFICIAL WOOL.

The yearly average earnings of a workman amount to 173.85 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 200                  | 89.24                |
| Monthly wages of:      |                      |                      |
| Sorters . . . . .      | 11                   | 7                    |
| Combers . . . . .      | 19.2                 | 12                   |
| Washers . . . . .      | 17.50                | 9.6                  |
| Dyers . . . . .        | 19.20                | 12.5                 |
| Spinners . . . . .     | 25                   | 11                   |
| Stokers . . . . .      | 25                   | 20                   |

XII.

MECHANICAL AND HAND WEAVING OF WOOL.

The yearly average earnings of a workman amount to 214.71 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 279.36               | 135.36               |
| Monthly wages of:      |                      |                      |
| Warpers . . . . .      | 37                   | 10                   |
| Spoolers . . . . .     | 18                   | 3.65                 |
| Reigers . . . . .      | 26.4                 | 18                   |
| Aids . . . . .         | 12                   | 9.60                 |
| Twisters . . . . .     | 36.3                 | 13.2                 |
| Winders . . . . .      | 18                   | 5.35                 |
| Pluckers . . . . .     | 16.8                 | 10.4                 |
| Darners . . . . .      | 38.4                 | 11.3                 |
| Weavers . . . . .      | 35                   | 8.3                  |
| Sizers . . . . .       | 21.6                 | 8                    |

|                         | Maximum.<br>Roubles. | Minimum. |                                 | Maximum.<br>Roubles. | Minimum. |
|-------------------------|----------------------|----------|---------------------------------|----------------------|----------|
| Tiers of warp . . . . . | 50                   | 25       | Twisters . . . . .              | 16                   | 4        |
| Packers . . . . .       | 21.6                 | 8        | Colour-fixers . . . . .         | 25                   | 6        |
| Steamers . . . . .      | 66                   | 25       | Cleaners of apparatus . . . . . | 20                   | 8        |
| Carpenters . . . . .    | 29                   | 15       | Peelers . . . . .               | 20.5                 | 3.60     |
| Smiths . . . . .        | 26                   | 5        | Spreaders. . . . .              | 16.5                 | 4        |

## XIII.

## SPINNING AND WEAVING OF WOOL, AND THE FINISHING DEPARTMENT.

The yearly average earnings  
of a workman amount to 197.02 roubles.

|                       | Maximum.<br>Roubles. | Minimum. |
|-----------------------|----------------------|----------|
| Fluctuations. . . . . | 225.6                | 133.4    |

## Monthly wages of:

|   |       |     |
|---|-------|-----|
| Machine weavers . . . . .                 | 37    | 7   |
| Hand . . . . .                            | 32    | 16  |
| Warpers . . . . .                         | 27.90 | 10  |
| Spoolers . . . . .                        | 14    | 5   |
| Cleaners . . . . .                        | 12    | 5   |
| Darners . . . . .                         | 12    | 5   |
| Unwinders . . . . .                       | 7     | 6   |
| Twisters . . . . .                        | 8     | 6   |
| Apparatus-men . . . . .                   | 32    | 25  |
| Peelers . . . . .                         | 11    | 8   |
| Spreaders. . . . .                        | 10    | 6.5 |
| Spinners . . . . .                        | 48    | 16  |
| Cloth fullers. . . . .                    | 20    | 5   |
| Ring-frame tenders . . . . .              | 10    | 7   |
| Steam mechanics and<br>stockers . . . . . | 20    | 14  |
| Black- and locksmiths . . . . .           | 32    | 16  |

## XIV.

## CLOTH MANUFACTORY.

The yearly average earnings  
of a workman amount to 174.5 roubles.

|                       | Maximum.<br>Roubles. | Minimum. |
|-----------------------|----------------------|----------|
| Fluctuations. . . . . | 240.70               | 124.47   |

## Monthly wages of:

|                           |      |      |
|---------------------------|------|------|
| Machine weavers . . . . . | 45   | 13   |
| Hand . . . . .            | 22   | 10   |
| Washers . . . . .         | 26   | 9.30 |
| Dryers . . . . .          | 25   | 5.5  |
| Pressers . . . . .        | 40   | 9.70 |
| Shearers . . . . .        | 45   | 4.25 |
| Combers . . . . .         | 25   | 6    |
| Dyers . . . . .           | 28   | 10   |
| Machine warpers . . . . . | 25   | 4    |
| Hand . . . . .            | 39   | 14   |
| Spoolers . . . . .        | 16   | 2    |
| Cleaners . . . . .        | 16.8 | 7    |
| Unwinders . . . . .       | 12   | 4.5  |

|                                 |      |      |
|---------------------------------|------|------|
| Twisters . . . . .              | 16   | 4    |
| Colour-fixers . . . . .         | 25   | 6    |
| Cleaners of apparatus . . . . . | 20   | 8    |
| Peelers . . . . .               | 20.5 | 3.60 |
| Spreaders. . . . .              | 16.5 | 4    |
| Spinners . . . . .              | 43   | 12.5 |
| Clothfullers . . . . .          | 26   | 6.80 |
| Frame-makers . . . . .          | 17.5 | 6.40 |
| Cloth-makers . . . . .          | 12   | 4    |
| Frame-spinners. . . . .         | 34   | 5.10 |
| Sorters . . . . .               | 32   | 12   |
| Worsted makers . . . . .        | 35   | 13   |
| Steamers . . . . .              | 50   | 16   |
| Black- and locksmiths . . . . . | 50   | 10   |

## XV.

## CLOTH-TRIMMING MANUFACTORY.

The yearly average earnings  
of a workman amount to 134.7 roubles.

|                       | Maximum.<br>Roubles. | Minimum. |
|-----------------------|----------------------|----------|
| Fluctuations. . . . . | —                    | —        |

## Monthly wages of:

|                         |      |      |
|-------------------------|------|------|
| Washers . . . . .       | 13   | 12   |
| Dryers . . . . .        | 13.5 | 12.5 |
| Pressers . . . . .      | 15   | 12   |
| Sheares . . . . .       | 11   | 7    |
| Combers . . . . .       | 12   | 10   |
| Dyers . . . . .         | 15   | 13.5 |
| Colour-fixers . . . . . | 13.5 | 12   |
| Cloth-fullers. . . . .  | 12.5 | 11.5 |
| Steamers . . . . .      | 25   | 18   |

## XVI.

## WOOL-WEAVING, PRINTING AND DYEING MANUFACTORIES.

The yearly average earnings  
of a workman amount to 169 roubles.

|                       | Maximum.<br>Roubles. | Minimum. |
|-----------------------|----------------------|----------|
| Fluctuations. . . . . | 174.5                | 164.5    |

## Monthly wages of:

|                             |      |       |
|-----------------------------|------|-------|
| Machine weavers . . . . .   | 37   | 9     |
| Hand . . . . .              | 34   | 11.8  |
| Steamers. . . . .           | 15   | 11    |
| Chemists . . . . .          | 15   | 10    |
| Whiteners . . . . .         | 15   | 10    |
| Washers . . . . .           | 20   | 10    |
| Dryers . . . . .            | 16   | 8.75  |
| Pressers . . . . .          | 12.5 | 11.5  |
| Shearers, combers . . . . . | 30   | 9     |
| Dyers . . . . .             | 15.5 | 10    |
| Sizers . . . . .            | 21   | 10    |
| Tiers of warp . . . . .     | 35   | 14.13 |

|                                     | Maximum.<br>Roubles. | Minimum. |
|-------------------------------------|----------------------|----------|
| Machine and hand warp-ers . . . . . | 30                   | 16.5     |
| Peelers and cleaners . .            | 24                   | 6.5      |
| Unwinders of wool . . .             | 12                   | 7.5      |
| Winders of warp . . . .             | 27.5                 | 8        |
| Twisters . . . . .                  | 27                   | 8        |
| Kerchief printers . . .             | 27                   | 19.5     |
| Colour-fixers . . . . .             | 20                   | 11       |
| Loom tacklers . . . . .             | 16                   | 12       |
| Steamers . . . . .                  | 45                   | 27       |
| Stokers . . . . .                   | 25                   | 10       |
| Smiths . . . . .                    | 36                   | 21       |
| Blacksmiths . . . . .               | 35                   | 20       |
| Hammerers . . . . .                 | 15                   | 12       |

XVII.

DYEING AND SETTING OF COLOURS ON WOOLLEN TISSUES, CLOTH AND TWEEDS.

The yearly average earnings of a workman amount to 174.85 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 218.88               | 138.28   |
| Monthly wages of:      |                      |          |
| Fullers . . . . .      | 20.2                 | 13.2     |
| Teaselers . . . . .    | 21.4                 | 12       |
| Shearers . . . . .     | 16.8                 | 9.2      |
| Dryers . . . . .       | 25.2                 | 10.5     |
| Pluckers . . . . .     | 17.30                | 9.10     |
| Pressers . . . . .     | 22.8                 | 12.5     |
| Dyers . . . . .        | 21.6                 | 11.5     |
| Rollers . . . . .      | 10.8                 | 9        |
| Washers . . . . .      | 21.3                 | 12.6     |
| Packers . . . . .      | 17.5                 | 10.8     |

XVIII.

HAT MANUFACTORY.

The yearly average earnings of a workman amount to 206 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 245.09               | 156      |
| Monthly wages of:      |                      |          |
| Fullers . . . . .      | 32                   | 20       |
| Trimmers . . . . .     | 20                   | 12       |
| Ironers . . . . .      | 20                   | 20       |
| Shapers . . . . .      | 51.5                 | 17.5     |
| Dyers . . . . .        | 21.5                 | 17.5     |

XIX.

SILK-WEAVING MANUFACTORY.

The yearly average earnings of a workman amount to 207.10 roubles.

|                           | Maximum.<br>Roubles. | Minimum. |
|---------------------------|----------------------|----------|
| Fluctuations . . . . .    | 256                  | 141.7    |
| Monthly wages of:         |                      |          |
| Machine weavers . . . .   | 42                   | 10.89    |
| Hand » . . . . .          | 31.7                 | 16.5     |
| Spoolers . . . . .        | 10.5                 | 4        |
| Winders . . . . .         | 22.3                 | 5.66     |
| Teasel-cleaners . . . . . | 14                   | 4.74     |
| Machine warpers . . . .   | 28.7                 | 7.5      |
| Hand » . . . . .          | 18.37                | 14.34    |
| Cleaners . . . . .        | 16                   | 5        |
| Pressers . . . . .        | 23                   | 10.2     |
| Dyers . . . . .           | 19                   | 10.2     |
| Twisters . . . . .        | 34                   | 23       |
| Folders . . . . .         | 26                   | 14       |
| Warp-tiers . . . . .      | 26                   | 20       |
| Locksmiths . . . . .      | 46                   | 18       |
| Steamers . . . . .        | 24                   | 14       |

XX.

SILK LACE MANUFACTORY.

The yearly average earnings of a workman amount to 436.8 roubles.

|                         | Maximum.<br>Roubles. | Minimum. |
|-------------------------|----------------------|----------|
| Fluctuations . . . . .  | 436.8                | —        |
| Monthly wages of:       |                      |          |
| Chief workmen . . . . . | 85                   | 10       |
| Tulle makers . . . . .  | 123                  | 108.8    |
| Dyers . . . . .         | 60                   | 32       |
| Workmen . . . . .       | 25                   | 13.4     |
| Workwomen . . . . .     | 12.5                 | 9.6      |

XXI.

VELVET MANUFACTORY.

The yearly average earnings of a workman amount to 211.10 roubles.

|                         | Maximum.<br>Roubles. | Minimum. |
|-------------------------|----------------------|----------|
| Fluctuations . . . . .  | 211.10               | —        |
| Monthly wages of:       |                      |          |
| Hand weavers . . . . .  | 32                   | 12       |
| Machine weavers . . . . | 24                   | 12       |
| Warpers . . . . .       | 16                   | 8        |
| Spoolers . . . . .      | 12                   | 6        |
| Winders . . . . .       | 12                   | 6        |
| Pickers . . . . .       | 12                   | 6        |
| Cleaners . . . . .      | 12                   | 6        |

## XXII.

## SPINNING AND COMBING OF FLAX.

The yearly average earnings of a workman amount to . . . . . 116.35 roubles.

|                          | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|--------------------------|----------------------|----------------------|
| Fluctuations . . . . .   | 155.4                | 111.76               |
| Monthly wages of:        |                      |                      |
| Weavers . . . . .        | 22.25                | 7.5                  |
| Combers . . . . .        | 12                   | 4.5                  |
| Ribbon makers . . . . .  | 10.25                | 4.5                  |
| Frame tenders . . . . .  | 10.25                | 3.5                  |
| Wadding-makers . . . . . | 12.50                | 3.5                  |
| Twisters . . . . .       | 15                   | 9.25                 |
| Twiners . . . . .        | 12                   | 5                    |

## XXIII.

## SPINNING AND WEAVING OF FLAX.

The yearly average earnings of a workman amount to . . . . . 124.31 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations . . . . .  | 128.10               | 112.15               |
| Monthly wages of:       |                      |                      |
| Cord-makers . . . . .   | 13.7                 | 10.5                 |
| Wadding-makers. . . . . | 17.7                 | 7.14                 |
| Doffers . . . . .       | 7.2                  | 3.60                 |
| Twisters . . . . .      | 12                   | 7.90                 |
| Card-tenders . . . . .  | 9.8                  | 6.30                 |
| Spreaders . . . . .     | 13.2                 | 7.20                 |
| Frame tenders . . . . . | 11                   | 9                    |
| Ribbon-makers . . . . . | 9.12                 | 6.3                  |
| Dryers . . . . .        | 17.4                 | 14.30                |
| Packers . . . . .       | 20.4                 | 4.90                 |
| Winders . . . . .       | 20.7                 | 4.90                 |
| Combers . . . . .       | 28.7                 | 9.60                 |
| Weavers, man or woman   | 20.60                | 7.90                 |
| Sizers . . . . .        | 27.8                 | 14                   |
| Warpers . . . . .       | 25                   | 20                   |
| Spoolers . . . . .      | 17                   | 4.5                  |

## XXIV.

## SPINNING AND WEAVING OF FLAX, AND THE BLEACHING OF LINEN.

The yearly average earnings of a workman amount to . . . . . 128.46 roubles.

|                          | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|--------------------------|----------------------|----------------------|
| Fluctuations . . . . .   | 139.17               | 119.5                |
| Monthly wages of:        |                      |                      |
| Wadding-makers . . . . . | 16.8                 | 7.90                 |

Maximum. Minimum.  
Roubles.

|                         |      |      |
|-------------------------|------|------|
| Twisters . . . . .      | 11.2 | 7.90 |
| Doffers . . . . .       | 8.4  | 3.6  |
| Reelers . . . . .       | 12   | 6    |
| Dryers . . . . .        | 15   | 11   |
| Card-tenders . . . . .  | 13   | 6.7  |
| Hecklers . . . . .      | 10.3 | 8.4  |
| Ribbon-makers . . . . . | 12   | 3.6  |
| Frame tenders . . . . . | 10.3 | 7.44 |
| Winders . . . . .       | 21   | 8    |
| Combers . . . . .       | 27   | 6    |
| Weavers . . . . .       | 26   | 8    |
| Warpers . . . . .       | 25   | 12   |
| Unwinders . . . . .     | 15   | 6    |
| Spoolers . . . . .      | 9    | 3.5  |
| Bleachers . . . . .     | 24   | 5.5  |

## XXV.

## FLAX-WEAVING MANUFACTORY.

The yearly average earnings of a workman amount to 145 roubles.

|                            | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|----------------------------|----------------------|----------------------|
| Fluctuations . . . . .     | 145                  | —                    |
| Monthly wages of;          |                      |                      |
| Weavers . . . . .          | 21.16                | 9.8                  |
| Machine spoolers . . . . . | 16.9                 | 11.80                |
| Hand spoolers . . . . .    | 6.85                 | 3.08                 |
| Cop winders . . . . .      | 7.75                 | 3.25                 |

## XXVI.

## LINEN-BLEACHING MANUFACTORY.

The yearly average earnings of a workman amount to . . . . . 185.36 roubles.

|                                | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|--------------------------------|----------------------|----------------------|
| Fluctuations . . . . .         | 185.36               | —                    |
| Monthly wages of:              |                      |                      |
| Boilers and dryers of yarn     | 19.03                | 14.51                |
| » of linen . . . . .           | 18.4                 | 15.5                 |
| Washers of linen . . . . .     | 21.8                 | 12                   |
| Buckers » » . . . . .          | 12.13                | 10.55                |
| Spreaders . . . . .            | 19.24                | 16.10                |
| Dryers and starchers . . . . . | 22                   | 15.50                |
| Calendriers . . . . .          | 17                   | 8.90                 |
| Beaters . . . . .              | 15.95                | 6.3                  |
| Packers . . . . .              | 22.2                 | 7.5                  |

## XXVII.

## PRODUCTION OF LINEN FOR BAGS.

The yearly average earnings of a workman amount to . . . . . 144.97 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 144.97               | —        |
| Monthly wages of:      |                      |          |
| Spinners . . . . .     | 19.2                 | 8        |
| Sizers . . . . .       | 22                   | 20       |
| Unwinders . . . . .    | 10                   | 8        |
| Trimmers . . . . .     | 15.8                 | 13.2     |
| Seamstresses . . . . . | 12                   | 10       |
| Locksmiths . . . . .   | 33                   | 12       |

XXVIII.

PRODUCTION OF ARTICLES IN JUTE.

The yearly average earnings of a workman amount to . . . . . 166.89 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 193.26               | 132.48   |
| Monthly wages of:      |                      |          |
| Spinners . . . . .     | 21.6                 | 9.60     |
| Twisters . . . . .     | 19.20                | 8.80     |
| Warpers . . . . .      | 13.6                 | 12       |
| Weavers . . . . .      | 26.4                 | 12.5     |
| Smoothers . . . . .    | 19.2                 | 12       |
| Reelers . . . . .      | 15                   | 9.60     |
| Scutchers . . . . .    | 28.8                 | 12       |
| Finishers . . . . .    | 16.3                 | 15       |
| Machinists . . . . .   | 40                   | 24       |
| Packers . . . . .      | 36                   | 7.70     |

XXIX.

PRODUCTION OF GUTTA-PERCHA ARTICLES.

The yearly average earnings of a workman amount to 260.71 roubles.

|                                      | Maximum.<br>Roubles. | Minimum. |
|--------------------------------------|----------------------|----------|
| Fluctuations . . . . .               | 402.2                | 257.65   |
| Monthly wages of:                    |                      |          |
| Weavers . . . . .                    | 58                   | 13       |
| Finishers . . . . .                  | 32                   | —        |
| Warpers . . . . .                    | 32                   | 17       |
| Winders . . . . .                    | 17                   | 10.5     |
| Tube makers . . . . .                | 38.4                 | 15.6     |
| Cushion and slipper makers . . . . . | 20.4                 | 12       |
| Dryers . . . . .                     | 28.8                 | 15.6     |
| Paint-makers . . . . .               | 19.2                 | 9.80     |
| Strap > . . . . .                    | 42                   | 18       |
| Surgical instrument-makers . . . . . | 31                   | 9.60     |
| Galosh trimmers . . . . .            | 12                   | 9.60     |
| Cutters . . . . .                    | 38.4                 | 16.8     |
| Polishers . . . . .                  | 40                   | 19.20    |
| Stretchers . . . . .                 | 26.4                 | 9.60     |

|                          | Maximum.<br>Roubles. | Minimum. |
|--------------------------|----------------------|----------|
| Hard gutta-percha makers | 36                   | 9.60     |
| Stove men . . . . .      | 40                   | 18       |

XXX.

PAPER MANUFACTURE.

The yearly average earnings of a workman amount to 175.6 roubles.

|                                      | Maximum.<br>Roubles. | Minimum. |
|--------------------------------------|----------------------|----------|
| Fluctuations . . . . .               | 234                  | 137.10   |
| Monthly wages of:                    |                      |          |
| Sorters of rags . . . . .            | 20                   | 6        |
| > > paper . . . . .                  | 13                   | 6        |
| Workers on clean rolls . . . . .     | 30                   | 17       |
| > > dirty > . . . . .                | 20                   | 16       |
| > > paper cutting machines . . . . . | 13                   | 9.60     |
| Calendriers . . . . .                | 40                   | 12       |
| Workers on whitening rolls . . . . . | 25                   | 12       |
| > > paper machines . . . . .         | 40                   | 11.5     |
| Rag boilers . . . . .                | 20                   | 13.20    |
| Chief workmen . . . . .              | 75                   | 25       |
| Machinists . . . . .                 | 50                   | 18       |
| Stokers . . . . .                    | 25                   | 15       |
| Packers . . . . .                    | 20                   | 8.40     |

XXXI.

MANUFACTURE OF PASTEBOARD AND PITCHED PAPER FOR ROOFS.

The yearly average earnings of a workman amount to 216.08 roubles.

|                                   | Maximum.<br>Roubles. | Minimum. |
|-----------------------------------|----------------------|----------|
| Fluctuations . . . . .            | 251                  | 166      |
| Monthly wages of:                 |                      |          |
| Sorters . . . . .                 | 12                   | 8        |
| Rollers . . . . .                 | 25                   | 16       |
| Makers of pitched paper . . . . . | 35                   | 28       |
| Machinists . . . . .              | 35                   | 12       |
| Stokers . . . . .                 | 25                   | 20       |

XXXII.

TAPESTRY MANUFACTURE.

The yearly average earnings of a workman amount to 209.37 roubles.

|                          | Maximum.<br>Roubles. | Minimum. |
|--------------------------|----------------------|----------|
| Fluctuations . . . . .   | 250                  | 157      |
| Monthly wages of:        |                      |          |
| Printers . . . . .       | 35                   | 14       |
| Primers . . . . .        | 25                   | 13       |
| Colour-rubbers . . . . . | 15.5                 | 10       |



|                      | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|----------------------|----------------------|----------------------|
| Rollers . . . . .    | 20                   | 8.5                  |
| Polishers . . . . .  | 22                   | 12                   |
| Doffers . . . . .    | 11                   | 8.5                  |
| Machinists . . . . . | 35                   | 20                   |
| Stokers . . . . .    | 20                   | 11                   |

## XXXIII.

## SAWMILLS.

The yearly average earnings  
of a workman amount to 237.17 roubles.

|                           | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|---------------------------|----------------------|----------------------|
| Fluctuations . . . . .    | 290                  | 109.44               |
| Monthly wages of:         |                      |                      |
| Sawfixers . . . . .       | 68                   | 10                   |
| Aids . . . . .            | 20                   | 7.2                  |
| Saw menders . . . . .     | 30                   | 20                   |
| Pilers . . . . .          | 25                   | 10                   |
| Plank receivers . . . . . | 22                   | 9.60                 |
| Sorters . . . . .         | 30                   | 12                   |
| Machinists . . . . .      | 27                   | 25                   |
| Stokers . . . . .         | 20                   | 15                   |
| Greasers . . . . .        | 15                   | 10                   |

## XXXIV.

## PRODUCTION OF BENT WOOD FURNITURE.

The yearly average earnings  
of a workman amount to 176.6 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 250                  | 138.24               |
| Monthly wages of:      |                      |                      |
| Turners . . . . .      | 34                   | 14.4                 |
| Benders . . . . .      | 30                   | 16.8                 |
| Polishers . . . . .    | 18.4                 | 7                    |
| Varnishers . . . . .   | 16                   | 8.4                  |
| Glossers . . . . .     | 15                   | 9.6                  |
| Carpenters . . . . .   | 41.5                 | 18                   |
| Wood benders . . . . . | 12                   | 9.60                 |
| Joiners . . . . .      | 45                   | 19.2                 |
| Sawers . . . . .       | 9.60                 | —                    |
| Menders . . . . .      | 17                   | 15.6                 |
| Locksmiths . . . . .   | 20.4                 | 16.8                 |
| Packers . . . . .      | 21                   | 9.5                  |

## XXXV.

## CAST-IRON AND MECHANIC FOUNDRIES.

The yearly average earnings  
of a workman amount to 321.74 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 604                  | 180.60               |

Maximum. Minimum.  
Roubles.

## Monthly wages of:

|                              |     |      |
|------------------------------|-----|------|
| Modellers . . . . .          | 96  | 14.5 |
| Casters . . . . .            | 156 | 14   |
| Coppersmiths . . . . .       | 96  | 16   |
| Locksmiths . . . . .         | 120 | 11.5 |
| Turners and parers . . . . . | 98  | 16   |
| Trimmers . . . . .           | 55  | 14   |
| Furnace tenders . . . . .    | 46  | 14.5 |
| Riveters . . . . .           | 96  | 17   |
| Tinners . . . . .            | 96  | 25   |
| Polishers . . . . .          | 28  | 10.8 |
| Hammerers . . . . .          | 36  | 11.5 |
| Different aids . . . . .     | 24  | 3.80 |
| Blacksmiths . . . . .        | 100 | 14.4 |
| Mechanics . . . . .          | 120 | 25   |
| Machinists . . . . .         | 140 | 17   |
| Stokers . . . . .            | 29  | 15   |

## XXXVI.

## STEEL FOUNDRY.

The yearly average earnings  
of a workman amount to 524.28 roubles.

|                              | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------------|----------------------|----------------------|
| Fluctuations . . . . .       | 524.28               | —                    |
| Monthly wages of:            |                      |                      |
| Melters . . . . .            | 86.5                 | 28.8                 |
| Founders . . . . .           | 76.5                 | 24                   |
| Coppersmiths . . . . .       | 67.2                 | 18                   |
| Furnace tenders . . . . .    | 45.5                 | 25                   |
| Casters . . . . .            | 86                   | 36                   |
| Rollers . . . . .            | 90                   | 17                   |
| Flatteners . . . . .         | 112                  | 36                   |
| Softeners . . . . .          | 84                   | 24                   |
| Smiths and turners . . . . . | 84                   | 24                   |
| Gaslighters . . . . .        | 38.5                 | 24                   |
| Sorters . . . . .            | 39.6                 | 25                   |
| Stokers . . . . .            | 38                   | 15.5                 |
| Blacksmiths . . . . .        | 51                   | 21.5                 |
| Hammerers . . . . .          | 33                   | 19.20                |
| Machinists . . . . .         | 96                   | 26.8                 |
| Aids . . . . .               | 24                   | 16                   |

## XXXVII.

## CONSTRUCTION OF MACHINES AND CARS.

The yearly average earnings  
of a workman amount to 300.84 roubles.

|                                  | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|----------------------------------|----------------------|----------------------|
| Fluctuations . . . . .           | 393.45               | 253.8                |
| Monthly wages of:                |                      |                      |
| Locksmiths and turners . . . . . | 43.6                 | 15                   |
| Blacksmiths . . . . .            | 52                   | 20                   |

|                                  | Maximum.<br>Roubles. | Minimum. |
|----------------------------------|----------------------|----------|
| Hammerers . . . . .              | 32                   | 16       |
| Founders . . . . .               | 60                   | 34       |
| Casters . . . . .                | 60                   | 34       |
| Furnace tenders . . . . .        | 40                   | 29       |
| Modellers . . . . .              | 38.2                 | 19.5     |
| Joiners and carpenters . . . . . | 45.6                 | 20.4     |
| Coppersmiths . . . . .           | 49                   | 19.5     |
| Planers and borers . . . . .     | 39.5                 | 14.7     |
| Melters . . . . .                | 40.90                | 28.7     |
| Painters . . . . .               | 43                   | 17.6     |
| Upholsterers . . . . .           | 26                   | 24       |
| Machinists . . . . .             | 40                   | —        |
| Stokers . . . . .                | 20                   | —        |
| Apprentices . . . . .            | 12.4                 | 7        |

XXXVIII.

MACHINES AND SHIP CONSTRUCTION, AND IRON-ROLLING MILLS.

The yearly average earnings of a workman amount to 337.91 roubles.

|                                     | Maximum.<br>Roubles. | Minimum. |
|-------------------------------------|----------------------|----------|
| Fluctuations . . . . .              | 462.5                | 297.5    |
| Monthly wages of:                   |                      |          |
| Modellers . . . . .                 | 79                   | 35       |
| Founders and casters . . . . .      | 96                   | 14.8     |
| Melters . . . . .                   | 47                   | 26       |
| Planers and borers . . . . .        | 93                   | 22       |
| Coppersmiths and riveters . . . . . | 101                  | 24       |
| Shipmakers . . . . .                | 59                   | 14       |
| Furnace tenders . . . . .           | 38                   | 25       |
| Flatteners and borers . . . . .     | 96                   | 30       |
| Puddlers . . . . .                  | 88                   | 35       |
| Settlers and hookers . . . . .      | 30                   | 17       |
| Wheelmakers . . . . .               | 68                   | 26       |
| Brass-smiths . . . . .              | 75                   | 15       |
| Blacksmiths . . . . .               | 98                   | 19       |
| Hammerers . . . . .                 | 50                   | 18       |
| Machinists . . . . .                | 60                   | 24       |
| Stokers . . . . .                   | 35                   | 12       |

XXXIX.

TUBE AND COPPER-ROLLING MILLS AND FOUNDRIES.

The yearly average earnings of a workman amount to 329.9 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 329.9                | —        |
| Monthly wages of:      |                      |          |
| Flatteners . . . . .   | 80                   | 14.4     |

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Cutters . . . . .      | 48                   | 16.5     |
| Matchers . . . . .     | 50.5                 | 26.5     |
| Furnace men . . . . .  | 77                   | 15.5     |
| Brass-smiths . . . . . | 48                   | 35       |
| Rollers . . . . .      | 41                   | 24       |
| Burnishers . . . . .   | 32                   | —        |
| Shearers . . . . .     | 19                   | 14.5     |
| Modellers . . . . .    | 55                   | 40       |
| Founders . . . . .     | 52                   | 29       |

XL.

CONSTRUCTION OF TELEGRAPHS. THE MAKING OF ELECTRO-TECHNICAL APPARATUS.

The yearly average earnings of a workman amount to 517.14 roubles.

|                                     | Maximum.<br>Roubles. | Minimum. |
|-------------------------------------|----------------------|----------|
| Fluctuations . . . . .              | 522                  | 507      |
| Monthly wages of:                   |                      |          |
| Locksmiths and turners . . . . .    | 112                  | 25       |
| Borers and planers . . . . .        | 32                   | 21       |
| Blacksmiths . . . . .               | 60                   | 36       |
| Hammerers . . . . .                 | 24                   | 17.5     |
| Coppersmiths and riveters . . . . . | 60                   | 30       |
| Modellers . . . . .                 | 80                   | 24       |
| Joiners and menders . . . . .       | 60                   | 38       |
| Tinners and water-layers . . . . .  | 65                   | 34       |
| Whitesmiths . . . . .               | 65                   | 34       |
| Polishers . . . . .                 | 31                   | 24       |
| Glossers . . . . .                  | 50                   | 40       |
| Setters . . . . .                   | 97                   | 36       |
| Wirewinders . . . . .               | 33                   | 19       |
| Machinists . . . . .                | 32.5                 | 27       |
| Mechanics . . . . .                 | 150                  | 36       |

XLI.

PRODUCTION OF WIRE AND HORSESHOE NAILS.

The yearly average earnings of a workman amount to 325.36 roubles.

|                                  | Maximum.<br>Roubles. | Minimum. |
|----------------------------------|----------------------|----------|
| Fluctuations . . . . .           | 354.5                | 275      |
| Monthly wages of:                |                      |          |
| Nailmakers . . . . .             | 81.6                 | 24       |
| Locksmiths and turners . . . . . | 42                   | 16       |
| Blacksmiths . . . . .            | 40                   | 16       |
| Wiremakers . . . . .             | 75                   | 19.2     |
| Screw-nut makers . . . . .       | 40                   | 16       |
| Sorters and packers . . . . .    | 15                   | 10.6     |

## XLII.

## PRODUCTION OF SCREWS AND OTHER METALLIC ARTICLES.

The yearly average earnings  
of a workman amount to 287.6 roubles.

|                               | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------------|----------------------|----------------------|
| Fluctuations . . . . .        | 322                  | 205                  |
| Monthly wages of:             |                      |                      |
| Locksmiths . . . . .          | 100                  | 16                   |
| Turners . . . . .             | 54                   | 13                   |
| Stampers . . . . .            | 35                   | 21                   |
| Drawers . . . . .             | 40                   | 21                   |
| Workers on machines . . . . . | 50                   | 12                   |
| Modellers . . . . .           | 54                   | 27                   |
| Box makers . . . . .          | 36                   | 26                   |
| Packers . . . . .             | 14.5                 | 7.5                  |

## XLIII.

## PRODUCTION OF ARTISTIC BRONZE AND COPPER ARTICLES.

The yearly average earnings  
of a workman amount to 322.3 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 365                  | 315.25               |
| Monthly wages of:      |                      |                      |
| Founders . . . . .     | 36                   | 16                   |
| Chasers . . . . .      | 36                   | 16                   |
| Tinners . . . . .      | 45                   | 20                   |
| Locksmiths . . . . .   | 72                   | 17                   |
| Turners . . . . .      | 48                   | 24                   |
| Repairers . . . . .    | 48                   | 24                   |
| Varnishers . . . . .   | 45                   | 20                   |
| Blacksmiths . . . . .  | 60                   | 35                   |
| Pressers . . . . .     | 48                   | 24                   |
| Polishers . . . . .    | 51                   | 17                   |

## XLIV.

## PLATED GOODS MANUFACTURE.

The yearly average earnings  
of a workman amount to 346.18 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations . . . . .  | 374                  | 296.10               |
| Monthly wages of:       |                      |                      |
| Turners . . . . .       | 65.2                 | 32                   |
| Polishers . . . . .     | 56.5                 | 30                   |
| Varnishers . . . . .    | 50                   | 16.6                 |
| Bronze makers . . . . . | 74.5                 | 32                   |
| Spoon makers . . . . .  | 60                   | 30                   |
| Galvanists . . . . .    | 45                   | —                    |

## XLV.

## PRODUCTION OF PHILOSOPHICAL INSTRUMENTS.

The yearly average earnings  
of a workman amount to 477.3 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations . . . . .  | 570.4                | 311.77               |
| Monthly wages of:       |                      |                      |
| Mechanics . . . . .     | 83.3                 | 26                   |
| Locksmiths . . . . .    | 41.5                 | 16.6                 |
| Turners . . . . .       | 33.5                 | 21                   |
| Founders . . . . .      | 25                   | —                    |
| Joiners . . . . .       | 64                   | 16.6                 |
| Glass blowers . . . . . | 37.5                 | 16.6                 |
| Painters . . . . .      | 37.4                 | 16.6                 |

## XLVI.

## PRODUCTION OF DECIMAL BALANCES.

The yearly average earnings  
of a workman amount to 419 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations . . . . .  | 475                  | 312                  |
| Monthly wages of:       |                      |                      |
| Chief workmen . . . . . | 60                   | 20                   |
| Blacksmiths . . . . .   | 75                   | 21.6                 |
| Joiners . . . . .       | 62                   | 22.5                 |
| Locksmiths . . . . .    | 75                   | 15                   |
| Aids . . . . .          | 22                   | 15                   |

## XLVII.

## PRODUCTION OF LITHOGRAPHIC AND PRINTING MACHINES.

The yearly average earnings  
of a workman amount to 412.4 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 412.4                | —                    |
| Monthly wages of:      |                      |                      |
| Blacksmiths . . . . .  | 51.5                 | 32                   |
| Locksmiths . . . . .   | 52.5                 | 26.5                 |
| Turners . . . . .      | 55                   | 34.5                 |
| Joiners . . . . .      | 46.5                 | 41                   |
| Aids . . . . .         | 33                   | 27                   |
| Apprentices . . . . .  | 21                   | 4.8                  |

## XLVIII.

## LAMP MANUFACTURE.

The yearly average earnings  
of a workman amount to 263.10 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations . . . . . | 405                  | 181.2                |

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Monthly wages of;       |                      |                      |
| Founders . . . . .      | 65                   | 4.5                  |
| Bronze makers . . . . . | 40                   | 15                   |
| Whiteners . . . . .     | 58.5                 | 6.5                  |
| Turners . . . . .       | 75                   | 4.5                  |
| Varnishers . . . . .    | 40                   | 10.8                 |
| Locksmiths . . . . .    | 30                   | —                    |

**XLIX.**

**CHEMICAL INDUSTRY.**

The yearly average earnings of a workman amount to 282.10 roubles.

|   | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|---|----------------------|----------------------|
| Fluctuations. . . . .                     | 350                  | 135.36               |
| Monthly wages of:                         |                      |                      |
| Retorters . . . . .                       | 30                   | 20                   |
| Charcoal burners . . . . .                | 29                   | 16                   |
| Workmen of the chemical section . . . . . | 25                   | 20                   |
| Acid makers . . . . .                     | 16                   | 12                   |
| Varnish makers . . . . .                  | 12                   | —                    |
| Lock- and blacksmiths . . . . .           | 90                   | 30                   |

**L.**

**MATCH INDUSTRY.**

The yearly average earnings of a workman amount to 121.62 roubles.

|                            | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|----------------------------|----------------------|----------------------|
| Fluctuations. . . . .      | 201.52               | 88.54                |
| Monthly wages of:          |                      |                      |
| Machinists . . . . .       | 55                   | 24                   |
| Stokers . . . . .          | 18                   | 17                   |
| Dryers . . . . .           | 19.2                 | 12                   |
| Doffers . . . . .          | 24                   | 6                    |
| Packers . . . . .          | 18                   | 3                    |
| Casemakers . . . . .       | 36                   | 20.7                 |
| Cutters of straw . . . . . | 28                   | 6                    |
| Dippers . . . . .          | 16                   | 8                    |
| Box makers . . . . .       | 10                   | 2                    |
| Band rollers. . . . .      | 9                    | 3                    |

**LI.**

**PRODUCTION OF COLOURS.**

The yearly average earnings of a workman amount to 202.8 roubles.

|                       | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------|----------------------|----------------------|
| Fluctuations. . . . . | 202.8                | —                    |
| Monthly wages of:     |                      |                      |
| Millers . . . . .     | 35.10                | —                    |

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Workmen . . . . .       | 16.6                 | 15.2                 |
| Working women . . . . . | 12.5                 | 6.40                 |
| Machinists . . . . .    | 36.5                 | —                    |
| Joiners . . . . .       | 34.4                 | —                    |

**LII.**

**GLASS MANUFACTURE.**

The yearly average earnings of a workman amount to 244.7 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations. . . . .   | 363                  | 102.11               |
| Monthly wages of:       |                      |                      |
| Blowers . . . . .       | 140                  | 19.20                |
| Polishers. . . . .      | 50                   | 7.2                  |
| Drawers . . . . .       | 72                   | 16.                  |
| Moulders. . . . .       | 10                   | 5.                   |
| Potters . . . . .       | 30                   | 17                   |
| Glass melters . . . . . | 75                   | 13.                  |
| Stokers . . . . .       | 20                   | 15                   |
| Cutters . . . . .       | 20                   | 16                   |
| Jar makers . . . . .    | 15                   | 3                    |
| Aids . . . . .          | 7                    | 3                    |

**LIII.**

**CEMENT MANUFACTURE.**

The yearly average earnings of a workman amount to 189.24 roubles.

|   | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|---|----------------------|----------------------|
| Fluctuations. . . . .                     | 246.7                | 164.16               |
| Monthly wages of:                         |                      |                      |
| Millers . . . . .                         | 40                   | 11.5                 |
| Stone hewers. . . . .                     | 35                   | 30                   |
| Breakers. . . . .                         | 25                   | 16                   |
| Weighers . . . . .                        | 18                   | 14.5                 |
| Dryers . . . . .                          | 25                   | 12                   |
| Burners . . . . .                         | 23                   | 12                   |
| Twirlers . . . . .                        | 18                   | 12                   |
| Doffers . . . . .                         | 25                   | 12                   |
| Machinists . . . . .                      | 45                   | 30                   |
| Workers at the elevator . . . . .         | 22                   | 16                   |
| Workers at the Gertelev machine . . . . . | 25                   | 16                   |

**LIV.**

**PRODUCTION OF CERESIN AND PARAFFIN.**

The yearly average earnings of a workman amount to 211.8 roubles.

|                       | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------|----------------------|----------------------|
| Fluctuations. . . . . | 211.8                | —                    |

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Monthly wages of:       |                      |                      |
| Workmen . . . . .       | 12                   | 9                    |
| Packers . . . . .       | 8                    | 6.5                  |
| Locksmiths . . . . .    | 28                   | 26                   |
| Candle makers . . . . . | 21.5                 | 17                   |

## LV.

## EARTHENWARE MANUFACTURE.

The yearly average earnings  
of a workman amount to 191.6 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations. . . . .   | 191.6                | —                    |
| Monthly wages of:       |                      |                      |
| Chief moulders. . . . . | 31                   | 17                   |
| Apprentices . . . . .   | 17                   | 8.5                  |
| Drawers . . . . .       | 36                   | 9                    |
| Trimmers. . . . .       | 14.5                 | 9                    |
| Workmen . . . . .       | 12.5                 | 6                    |

## LVI.

## BRICK MANUFACTURE.

The yearly average earnings  
of a workman amount to 164.9 roubles.

|                                 | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|---------------------------------|----------------------|----------------------|
| Fluctuations. . . . .           | 264                  | 121.4                |
| Monthly wages of:               |                      |                      |
| Burners . . . . .               | 40                   | 12                   |
| Moulders . . . . .              | 35                   | 12                   |
| Loaders and unloaders . . . . . | 20                   | 8                    |
| Kneaders . . . . .              | 21                   | 11                   |
| Wheelers. . . . .               | 17                   | 10                   |

## LVII.

## STONE-CUTTING INDUSTRY.

The yearly average earnings  
of a workman amount to 388 roubles.

|                       | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------|----------------------|----------------------|
| Fluctuations. . . . . | 430                  | 360                  |
| Monthly wages of:     |                      |                      |
| Cutters . . . . .     | 48                   | 36                   |
| Hewers . . . . .      | 45                   | 31                   |
| Polishers. . . . .    | 66                   | 21                   |
| Aids . . . . .        | 16                   | 14.5                 |

## LVIII.

## FLOUR MANUFACTURE.

The yearly average earnings  
of a workman amount to 305.6 roubles.

|                         | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-------------------------|----------------------|----------------------|
| Fluctuations. . . . .   | 373.3                | 230.4                |
| Monthly wages of:       |                      |                      |
| Millers. . . . .        | 55                   | 21.6                 |
| Stenters . . . . .      | 28.8                 | 24                   |
| Valveitters . . . . .   | 24                   | 16.3                 |
| Cleaners . . . . .      | 36                   | 16.8                 |
| Incisers . . . . .      | 38.4                 | 28.8                 |
| Greasers . . . . .      | 31                   | 24                   |
| Common workmen. . . . . | 27                   | 9                    |
| Machinists . . . . .    | 36                   | 28                   |

## LIX.

## CHOCOLATE MANUFACTURE.

The yearly average earnings  
of a workman amount to 190.6 roubles.

|                            | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|----------------------------|----------------------|----------------------|
| Fluctuations. . . . .      | 204                  | 148.44               |
| Monthly wages of:          |                      |                      |
| Chief workmen. . . . .     | 85                   | 25                   |
| Caramel makers . . . . .   | 30                   | 9                    |
| Chocolate makers . . . . . | 25                   | 9                    |
| Packers . . . . .          | 20                   | 9                    |
| Daily workmen. . . . .     | 9.5                  | 7.2                  |

## LX.

## DISTILLERIES OF VODKA.

The yearly average earnings  
of a workman amount to 254 roubles.

|                       | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|-----------------------|----------------------|----------------------|
| Fluctuations. . . . . | 434                  | 166                  |
| Monthly wages of:     |                      |                      |
| Distiller . . . . .   | 83                   | 70                   |
| Bottlers . . . . .    | 24                   | 11                   |
| Rinsers . . . . .     | 17                   | 5.5                  |
| Band-rollers. . . . . | 22                   | 16                   |
| Packers . . . . .     | 17                   | 11                   |
| Coal-men . . . . .    | 16                   | 14                   |
| Machinists . . . . .  | 25                   | 24                   |
| Stokers . . . . .     | 15                   | 13                   |

## LXI.

## CHICORY MANUFACTURE.

The yearly average earnings  
of a workman amount to 202.6 roubles.

|                        | Maximum.<br>Roubles. | Minimum.<br>Roubles. |
|------------------------|----------------------|----------------------|
| Fluctuations. . . . .  | 202.6                | —                    |
| Monthly wages of:      |                      |                      |
| Chief workmen. . . . . | 55                   | —                    |
| Mechanics . . . . .    | 35                   | —                    |
| Corkers . . . . .      | 39                   | 31                   |

|                     | Maximum.<br>Roubles | Minimum.<br>Roubles |
|---------------------|---------------------|---------------------|
| Packers . . . . .   | 31                  | 21                  |
| Boxmakers . . . . . | 15                  | 7.5                 |

LXII.

MACARONI MANUFACTURE.

The yearly average earnings of a workman amount to 210.83 roubles.

|                         | Maximum.<br>Roubles | Minimum.<br>Roubles |
|-------------------------|---------------------|---------------------|
| Fluctuations . . . . .  | 210.83              | —                   |
| Monthly wages of:       |                     |                     |
| Kneaders . . . . .      | 35                  | 30                  |
| Pressers . . . . .      | 23                  | 18                  |
| Dryers . . . . .        | 30                  | 8                   |
| Packers . . . . .       | 30                  | 8                   |
| Chief workmen . . . . . | 38                  | —                   |

LXIII.

BEER AND MEAD BREWERIES.

The yearly average earnings of a workman amount to 211.3 roubles.

|                           | Maximum.<br>Roubles | Minimum.<br>Roubles |
|---------------------------|---------------------|---------------------|
| Fluctuations . . . . .    | 300                 | 170                 |
| Monthly wages of:         |                     |                     |
| Maltmen . . . . .         | 56                  | 14                  |
| Mash makers . . . . .     | 23                  | 13                  |
| Fermenters . . . . .      | 56                  | 13                  |
| Bottlers . . . . .        | 30                  | 14                  |
| Rinsers . . . . .         | 28                  | 9                   |
| Coopers . . . . .         | 48                  | 20                  |
| Barrel steamers . . . . . | 25                  | 13                  |
| Stokers . . . . .         | 45                  | 18                  |
| Gas lighters . . . . .    | 18                  | 14                  |
| Blacksmiths . . . . .     | 45                  | 30                  |
| Carpenters . . . . .      | 35                  | 12                  |
| Chief workmen . . . . .   | 86                  | 45                  |

LXIV.

BET SUGAR PRODUCTION AND SUGAR REFINERIES.

The yearly average earnings of a workman amount to 159.60 roubles.

|                                     | Maximum.<br>Roubles | Minimum.<br>Roubles |
|-------------------------------------|---------------------|---------------------|
| Fluctuations . . . . .              | 307.95              | 115.76              |
| Monthly wages of:                   |                     |                     |
| Machinists . . . . .                | 60                  | 20                  |
| Apparatus men . . . . .             | 36                  | 11                  |
| Helpers to machine feeder . . . . . | 24                  | 11                  |

|  | Maximum.<br>Roubles | Minimum.<br>Roubles |
|--|---------------------|---------------------|
| Workmen of the beet section . . . . .      | 11                  | 7                   |
| Diffusers . . . . .                        | 9.5                 | 6                   |
| Workmen of the filtering section . . . . . | 16                  | 8                   |
| Whiteners . . . . .                        | 19                  | 13                  |
| Steamers . . . . .                         | 9                   | 6                   |
| Chief workmen . . . . .                    | 30                  | 7                   |
| Half-workmen * . . . . .                   | 11                  | 3.5                 |

LXV.

TOBACCO FACTORIES.

The yearly average earnings of a workman amount to 147.10 roubles.

|                                    | Maximum.<br>Roubles | Minimum.<br>Roubles |
|------------------------------------|---------------------|---------------------|
| Fluctuations . . . . .             | 250                 | 117                 |
| Monthly wages of:                  |                     |                     |
| Machine crumbers . . . . .         | 40                  | 17.2                |
| Hand . . . . .                     | 58                  | 12                  |
| Cigar makers . . . . .             | 40                  | 10                  |
| Cigarette makers . . . . .         | 30                  | 7.2                 |
| Sorters . . . . .                  | 48                  | 4                   |
| Fillers . . . . .                  | 50                  | 10                  |
| Glueers . . . . .                  | 27                  | 8                   |
| Dryers . . . . .                   | 34                  | 8                   |
| Paper cutters . . . . .            | 36                  | 10                  |
| Workers on case-machines . . . . . | 21                  | 9.6                 |
| Band-rollers . . . . .             | 21                  | 8                   |
| Packers . . . . .                  | 33                  | 9.6                 |
| Machinists . . . . .               | 70                  | 20                  |
| Chief workmen . . . . .            | 70                  | 40                  |

LXVI.

LEATHER MANUFACTURE.

The yearly average earnings of a workman amount to 328.57 roubles.

|                           | Maximum.<br>Roubles | Minimum.<br>Roubles |
|---------------------------|---------------------|---------------------|
| Fluctuations . . . . .    | 402                 | 228                 |
| Monthly wages of:         |                     |                     |
| Tanners . . . . .         | 50                  | 12                  |
| Cleaners . . . . .        | 40                  | 16                  |
| Groovers . . . . .        | 86                  | 20                  |
| Cutters . . . . .         | 48                  | 24                  |
| Shagreen makers . . . . . | 28                  | 16                  |
| Aids . . . . .            | 20                  | 9                   |
| Machinists . . . . .      | 45                  | 30                  |

\* In the refineries of southern Russia working women and minors, workmen and women are called 'half workmen'.

## LXVII.

## PRODUCTION OF LEATHER ARTICLES.

The yearly average earnings  
of a workman amount to 500 roubles.

|                         | Maximum.<br>Roubles. | Minimum. |
|-------------------------|----------------------|----------|
| Fluctuations . . . . .  | 500                  | —        |
| Monthly wages of:       |                      |          |
| Chief workmen . . . . . | 50                   | 15.5     |

## LXVIII.

## MACHINE PRODUCTION OF BOOTS AND SHOES.

The yearly average earnings  
of a workman amount to 292.28 roubles.

|                               | Maximum.<br>Roubles. | Minimum. |
|-------------------------------|----------------------|----------|
| Fluctuations . . . . .        | 292.28               | —        |
| Monthly wages in:             |                      |          |
| The cutting section . . . . . | 58.76                | 38.8     |
| › sewing › . . . . .          | 41.7                 | 21.7     |
| › tightening › . . . . .      | 77                   | 39.5     |
| › heel-making › . . . . .     | 64.2                 | 43.9     |
| › trimming › . . . . .        | 51.3                 | 36.4     |
| › preparatory › . . . . .     | 57.3                 | 28       |
| › felt-making › . . . . .     | 56.1                 | 26.9     |
| › trunk-making › . . . . .    | 49.9                 | 24.5     |

## LXIX.

## STEARINE MANUFACTURE.

The yearly average earnings  
of a workman amount to 190.6 roubles.

|                         | Maximum.<br>Roubles. | Minimum. |
|-------------------------|----------------------|----------|
| Fluctuations . . . . .  | 190.6                | —        |
| Monthly wages of:       |                      |          |
| Chief workmen . . . . . | 45                   | 35       |
| Common › . . . . .      | 21                   | 12.5     |
| Workwomen . . . . .     | 11                   | 6        |

## LXX.

## SOAP MANUFACTURE.

The yearly average earnings  
of a workman amount to 218 roubles.

|                         | Maximum.<br>Roubles. | Minimum. |
|-------------------------|----------------------|----------|
| Fluctuations . . . . .  | 218                  | —        |
| Monthly wages of:       |                      |          |
| Soapboilers . . . . .   | 81.5                 | —        |
| Chemists . . . . .      | 60                   | —        |
| Apparatus men . . . . . | 43                   | —        |
| Workmen . . . . .       | 30                   | 6        |

## LXXI.

## ALBUMEN MANUFACTURE.

The yearly average earnings  
of a workman amount to 294.6 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 294.6                | —        |
| Monthly wages of:      |                      |          |
| Blooders . . . . .     | 22                   | —        |
| Dryers . . . . .       | 23                   | —        |
| Workmen . . . . .      | 17                   | —        |
| Stokers . . . . .      | 30                   | —        |
| Locksmiths . . . . .   | 30                   | —        |

## LXXII.

## BRUSH AND COMB MANUFACTURE.

The yearly average earnings  
of a workman amount to 195.2 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 283.4                | 137.5    |
| Monthly wages of:      |                      |          |
| Workmen . . . . .      | 60                   | 7.5      |
| Women . . . . .        | 14                   | 3.60     |

## LXXIII.

## BONE-BURNING INDUSTRY.

The yearly average earnings  
of a workman amount to 245.4 roubles.

|                        | Maximum.<br>Roubles. | Minimum. |
|------------------------|----------------------|----------|
| Fluctuations . . . . . | 245.4                | —        |
| Monthly wages of:      |                      |          |
| Workmen . . . . .      | 50                   | 13       |
| Women . . . . .        | 15                   | 10       |
| Stokers . . . . .      | 60                   | 45       |

## LXXIV.

## TYPOGRAPHIC INDUSTRY.

The yearly average earnings  
of a workman amount to 308.42 roubles.

|                           | Maximum.<br>Roubles. | Minimum. |
|---------------------------|----------------------|----------|
| Fluctuations . . . . .    | 388.9                | 195.65   |
| Monthly wages of:         |                      |          |
| Clickers . . . . .        | 70                   | 50       |
| Engravers . . . . .       | 120                  | 25       |
| Casemen . . . . .         | 75                   | 10       |
| Lithographers . . . . .   | 55                   | 20       |
| Bookbinders . . . . .     | 40                   | 10       |
| Letter founders . . . . . | 35                   | 12       |
| Machine feeders . . . . . | 20                   | 14       |
| Printers . . . . .        | 18                   | 14       |
| Phototypers . . . . .     | 90                   | 20       |
| Apprentices . . . . .     | 12                   | 4        |
| Machinists . . . . .      | 96                   | 24       |

## CHAPTER XXIX.

## The Industries of the Grand Duchy of Finland.

**A**GRICULTURE, forestry and cattle breeding form the principal sources of livelihood of the people of Finland. The industrial activity of the country, except so far as it is based on work connected with the products of these three leading industries, plays therefore a comparatively little important part in the economic life of the people. The chief obstacle to a wider development of its industry appears to be the lack of different kinds of raw materials. For this reason, the industrial products exported to Western Europe, or to countries lying beyond Europe, are almost exclusively restricted to articles that are the production of forest industry, namely: all kinds of wood materials, splints for matches, pitch, pasteboard, wooden paper pulp, et cetera. The articles transported to the neighbouring districts of Russia are somewhat more varied, and include, besides those already mentioned, iron and iron wares, cotton and flax goods, skins and hides, glass and earthenware articles.

The extent to which the industrial productiveness of Finland has been allowed to develop has with rare exceptions been restricted to supplying the very limited wants of the country itself, and this of course has given a peculiar form and cast to this branch of national activity. A by no means unimportant hindrance to the enlivenment of Finnish industry is to be found in the relatively small capitals at the disposal of the inhabitants of the country, as well as to the slow growth of national wealth; whilst foreign capital is attracted on no great scale, in consequence of an insufficient acquaintance on the part of foreigners with the actual economic organization of the country, and the necessary conditions of its industrial productiveness.

The following review is mainly confined to a period of five years, from 1886 to 1890. Information relating to earlier periods is either extremely defective, or drawn up on a scheme so different to the plan adopted at present, that any statistical comparison is out of the question. At the same time, the review has as far as possible been made so as to include periods earlier than the years just mentioned.



It is necessary to remark that the figures given in the subjoined tables embrace not only the manufactured, but also the trade productions of the country, so far as the latter are worked with the aid of hired hands in workshops, but do not include the so-called village hand industries. Only a few of the village trades, which in general bear the character of village hand work industry, will therefore be tabulated for the sake of comparison. In the trade returns for Finland no difference has during the last few years been made between factory and trade industries, so that in many cases it is almost impossible to draw any definite line of distinction between them.

The general proportions of industrial activity in Finland, as well as the extent of its development during the last five years, are set forth in the following table, which shows the number of manufacturing houses (works, factories and workshops) and also the gross value of the products, in Finnish marks, reckoned at forty kopecks.

| Y E A R S. | FACTORY AND TRADE INDUSTRY.          |                         |                                 | METALLURGIC, ENGINE BUILDING AND OTHER METAL INDUSTRIES. |                         |                                 | T O T A L.                           |                            |                         |                            |                                 |                            |
|------------|--------------------------------------|-------------------------|---------------------------------|--|-------------------------|---------------------------------|--------------------------------------|----------------------------|-------------------------|----------------------------|---------------------------------|----------------------------|
|            | Number of manu-<br>facturing houses. | Number of work-<br>men. | Value of prod-<br>uct in marks. | Number of manu-<br>facturing houses.                     | Number of work-<br>men. | Value of prod-<br>uct in marks. | Number of manu-<br>facturing houses. | Increased per-<br>centage. | Number of work-<br>men. | Increased per-<br>centage. | Value of prod-<br>uct in marks. | Increased per-<br>centage. |
| 1886       | 4,625                                | 34,877                  | 94,779,580                      | —  | —                       | 14,868,700                      | —                                    | —                          | —                       | —                          | 109,648,280                     | —                          |
| 1887       | 4,864                                | 36,304                  | 100,588,479                     | 880  | 7,228                   | 14,719,342                      | 5,744                                | —                          | 43,532                  | —                          | 115,307,821                     | 5.1                        |
| 1888       | 5,141                                | 38,330                  | 108,130,126                     | 930  | 7,996                   | 16,103,324                      | 6,071                                | 5.8                        | 46,326                  | 6.4                        | 124,233,450                     | 7.7                        |
| 1889       | 5,384                                | 44,729                  | 133,902,033                     | 868  | 8,327                   | 18,769,550                      | 6,252                                | 3.0                        | 53,556                  | 15                         | 152,671,583                     | 23                         |
| 1890       | 5,551                                | 49,137                  | 141,748,290                     | 937  | 9,706                   | 23,593,678                      | 6,488                                | 3.8                        | 58,843                  | 9.8                        | 165,341,968                     | 8.2                        |

As is shown in the above table, the industry of the country, during the period it embraces, increased with comparative rapidity, and the gross value of the yearly product has since 1886 increased by 55,693,688 marks, that is to say, 50 per cent. This increase has been mainly caused by the favourable economic conditions that prevailed during this period, among which the rich harvest of these five years, and the energy with which the ways of communication were improved, a whole network of railways was formed, and a sea passage with Western Europe was opened up and established, must be reckoned as the leading and principal factors. The most favourable year in these respects appears to have been 1889, in which the increased industrial activity of the country is most patent and evident.

As the population of Finland at the end of the year 1890 amounted to 2,380,140 souls, the number of work people engaged in its different industries amounts to 2.5 per cent of the entire population. If the gross value of the industrial product of the same year be distributed among the whole population, the average sum for each inhabitant of the country will be 74 marks.

The average number of work people in each of the works, as well as the average

value of the gross product for each factory and each workman, may be gathered from the following table.

| Y E A R S.    | VALUE OF GROSS PRODUCT IN FINNISH MARKS.        |                                      |  |
|---------------|---|--------------------------------------|--|
|               | AVERAGE NUMBER OF WORKMEN IN EACH OF THE WORKS. | ON AN AVERAGE FOR EACH OF THE WORKS. | ON AN AVERAGE FOR EACH OF THE WORK PEOPLE. |
| 1887. . . . . | 7.6   | 20,074                               | 2,646                                      |
| 1888. . . . . | 7.6   | 20,463                               | 2,682                                      |
| 1889. . . . . | 8.6   | 24,420                               | 2,851                                      |
| 1890. . . . . | 9.0   | 24,489                               | 2,810                                      |

The figures in the first two columns sufficiently prove the large increase in the more important manufacturing industries of the country. The increase in the value of gross product for each of the work people is apparently explained by an increased intensiveness in the work, and by the greater use of engines and machinery power. Of all the industrial works, the largest number of hands is employed in the cotton mills of Finleyson and Company at Tammerfors, amounting in 1890 to 2,076, the value of the product being 6,200,000 marks. The next in order are the cotton mills, also at Tammerfors, of the joint-stock company, Forssa, with 1,232 work people, the value of the production being 4,400,000 marks.

The industrial activity of the country in 1891 was divided between its towns and villages in such a way that about 50 per cent of its factories and works, about 52 per cent of its workmen, and about 55 per cent of the whole value of its industrial products fell to the share of the towns; nor during these five years has there been any tendency shown towards a change in this respect.

Of the industrial centres of the country, Tammerfors merits special mention. This city, whose population in 1891 amounted to 21,333 souls, lies on the banks of a river bearing the same name, and uniting the two large lakes of Näsijärvi and Pyhäjärvi. With a view of protecting the use of the available water power, the Emperor Alexander I, already in the year 1821 granted the city certain rights and privileges, the most valuable of which proved to be the right enjoyed by all persons then or afterwards engaged in any commercial industry in the city to import free of duty all dry materials and machines necessary in their business. These privileges, which were renewed in 1856, continue in force up to the year 1905. Thanks to these circumstances, the manufacturing industries of the city were quickly and considerably developed. This is shown by the fact that in 1891 there were 223 factories and trading works, employing 5,476 hands, and producing goods to the total value of 15,327,877 marks. The water power used may be calculated at 4,000 horse power, besides which, 29 steam engines, altogether 2,257 horse power, were at work. Of the city factories, the most noteworthy are the cotton mills of Finleyson and Company already mentioned, with 2,076 workmen; a flax factory, with 1,151 workmen; a cloth factory, with 334 workmen; and the writing paper mills of J. C. Frenckel and Son, with 276 work people.

Of the 58,843 hands employed throughout the country in the year 1890, there were 11,903 women, that is, 20.2 per cent of the whole number; 5,694

minors between 15 and 18 years of age, that is, 9.7 per cent; and 2,038 children, between 12 and 15 years of age, that is, 3.5 per cent; and since that year no perceptible change in the proportion of the numbers has been made. Great differences in the proportionate employment of men, women and children are naturally to be remarked in the various industries; and it is in the thread factories that the largest number of women workers is to be found. Of 6,435, the whole number of hands employed in this industry in 1890, there were 4,061 women, that is, 63.1 per cent; 1,064 minors, that is, 16.7 per cent; and 552 children, that is, 8.6 per cent.

In connection with this it may be remarked that, according to the law which came into force on January 1, 1890, children are not allowed to work in factories longer than seven hours a day, during which time there must be not less than two intervals for rest, making up together not less than two hours; and neither young persons nor children are allowed to be engaged for night work. All children workers, who have not passed through a higher national school, are required to devote not less than twelve hours a week to class studies. The same law contains definite statutes relating to the protection of work people from accidents and illnesses during the time of work.

Of the whole number of workmen, 1,207, that is, 2 per cent, are not Finnish citizens, and it is in the glass industry that the largest number of foreigners is to be found. Of these latter, numbering in all 918, the majority is composed of Germans and Swedes, of whom there were in 1890, 170, that is, 18.5 per cent. It must not however be forgotten that not a few of the work people of foreign extraction have long been permanent and settled residents in the country.

The use of mechanical, and particularly steam power has greatly increased throughout the country. In consequence of there being no returns of the amount of power used in iron forges and engine-building works, the subjoined figures refer only to the other departments of the manufacturing industry.

| Y E A R S.     | NUMBER OF<br>STEAM EN-<br>GINES AT<br>WORK. | HORSE POWER. | AVERAGE NUMBER OF<br>HORSE POWER PER<br>EACH STEAM ENGINE. | AVERAGE NUMBER OF<br>WORKMEN PER HORSE<br>POWER. |
|----------------|---|--------------|--|--|
| 1886 . . . . . | 419   | 7,568        | 18   | 4.6  |
| 1887 . . . . . | 451   | 8,266        | 18.3   | 4.4  |
| 1888 . . . . . | 519   | 9,353        | 18   | 4.2  |
| 1889 . . . . . | 609   | 10,383       | 17   | 4.3  |
| 1890 . . . . . | 698   | 12,017       | 17.2   | 4.1  |
| 1891 . . . . . | 734   | 14,827       | 20.2   | 3.4  |

The fact that the average number of work people for each machinery horse power diminishes in a sufficiently regular proportion, shows that machinery is more and more replacing manual work, so that in 1891 for each machinery horse power there were 26 per cent less work people than in 1886. The table further shows that, on the whole, the machinery power employed for industrial purposes almost doubled during the above period of six years.

In a country so rich in water and in rapids as Finland, steam power cannot of itself be the only machinery power employed in industrial production, but on the contrary, water power will play the more important part. Unfortunately, the returns relating to the use of water power are very incomplete, and it can be stated only in approximate figures. As far as can be calculated, in the year 1890, there were used 6,923 water motors, that is, approximately 44,000 horse power. That only an unimportant portion of the water power available in the country was used, is plain from the fact that, according to the calculation made by the Chief Department of Road and Water constructions in Finland, there are nearly 1,000 rapids, representing roughly about 3,000,000 horse power. It will be understood that a large number of these rapids, partly from their position, partly from their character, are quite unsuited to be applied to industrial uses.

All the mechanical motors employed with an industrial purpose may, therefore, be reckoned in round numbers to amount to 60,000 horse power, which constitutes on an average about 1 horse power for each workman, and for every 38 souls of the whole population of the country.

There does not at the present time exist any law compelling employers and their employees to form mutual aid associations, and to be members of such associations. But a considerable number of such voluntary organizations have been formed, some of which have already been in existence for many years, but most of them have been founded within a recent period; so that of 127 mutual associations which existed at the end of 1889 no less than 60, that is to say, 47 per cent, had been established within the last ten years. The number of members belonging to these mutual aid associations in the same year amounted to 16,889, of which number 14,789 had the right to receive aid in case of illness; 12,039 had the right to receive funeral grants, and 10,105 a pension for themselves, and in case of death, for their widows and children.

The revenue of these associations amounted in 1889 to a total of 400,503 marks, of which member subscriptions furnished 31 per cent, and annual contributions made by the employers formed 15.8 per cent; besides which, the interest on the accumulated capital amounted to 26 per cent, the remaining part consisting of different subscriptions and endowments. The average share of each member of the association, therefore, is 24.87 marks.

The expenses incurred by these associations for the same period amounted to 219,717 marks; being distributed over the following different outlays:

|                                   |         |        |          |      |           |
|-----------------------------------|---------|--------|----------|------|-----------|
| Grants in cases of illness        | 130,607 | marks, | that is, | 59.5 | per cent. |
| Grants for funerals . . . . .     | 7,254   | »      | »        | 3.3  | »         |
| Pensions . . . . .                | 54,991  | »      | »        | 25.0 | »         |
| Administrative expenses . . . . . | 6,907   | »      | »        | 3.1  | »         |
| Extra expenses . . . . .          | 19,958  | »      | »        | 9.1  | »         |

The grants that were made amounted, therefore, altogether to 192,853 marks, that is, 87.8 per cent of all the expenses and outlays.

The average expenses for each member amounted to 13.65 marks, of which the grants made in cases of illness amounted to 8.11 marks. Pensions were on an aver-

age enjoyed by 4.9 per cent of all the members of the pension fund, the average amount of the pension being 104.55 marks. The means at the disposal of these associations at the end of 1889 formed a total sum of 2,278,629 marks; that is to say, the average sum for each association amounted to 21,234 marks; and for each individual member, to 124.46 marks.

#### METALLURGIC INDUSTRY AND METAL PRODUCTIONS.

The soil of Finland consists of mountainous beds, dating from the very earliest of the geological periods, the archaic formation. All the subsequent formations are wanting, up to the most recent, the glacial period, the layers of which, consisting of stone, clay, sand and turf moss, cover the solid mountainous base. From the compact mountainous beds, and also from the earth strata, the country obtains the raw materials for its metallic products. The mountains, however, are in general poor in minerals, which moreover are for the most part impure, and are never found in large masses. In consequence of this, metallurgy has never reached a high stage of development. The following metals are found in the country.

*Gold:* In 1868, alluvial deposits of gold were discovered in Lapland, in the channel of the river Ivalojoiki that flows into lake Enare, and from the year 1870, gold washing has been carried on in that place. Gold has also been found in other northern localities, but in such small quantities that any thing like gold digging has been out of the question. The largest quantity of gold was found in 1871 in the Lapland mines, namely 56,692 grams; the smallest in 1886, were only 4,761 grams were found.

The finds for the succeeding years were as follows:

|                 | Year 1887 | 1888   | 1889   | 1890   |
|-----------------|-----------|--------|--------|--------|
| Grams . . . . . | 6,750     | 13,525 | 22,864 | 17,840 |

During the twenty-one years that these mines have been worked, 361 kilograms have been extracted, to the value of 1,160,000 marks.

*Silver:* This metal is found in very small quantities. It had long been known that in certain places silver existed in galena, and for a short while the silver veins were worked, but the returns proved so slight that further operations were soon suspended. At the present time, silver is extracted only in the form of an illegitimate product, during copper smelting operations at Pitkaranta, where the following quantities of silver have been obtained:

|                     | Year 1884 | 1886  | 1888 | 1890  |
|---------------------|-----------|-------|------|-------|
| Kilograms . . . . . | 467.7     | 470.9 | 424  | 817.6 |

During the last seven years, 2,248 kilograms have been extracted, to the value of 688,000 marks.

*Copper:* Copper mines are to be met with in many parts of the country, but in consequence of their poorness, the greater number of the mines, after having been worked for a short while, have been abandoned. In the second half of the present cen-

ture only two mines, one at Orijärvi, and the other at Pitkäranta, have been worked. The copper finds, which were never of any great importance, gradually lessened from 1860 to 1870, so that the quantity of ore extracted in 1862 amounted to 174.7 tons; in 1866, to 40.5 tons; and in 1872, to 18.4 tons. In the beginning of 1880, digging operations at Orijärvi were suspended; and from that date only one copper smelting foundry, that at Pitkäranta, has been at work. The operations carried on at this foundry have within the last few years considerably increased. The following quantities of copper have been extracted at these works:

|            | Year 1884 | 1886  | 1888  | 1889  | 1890  |
|------------|-----------|-------|-------|-------|-------|
| Tons . . . | 190.5     | 214.7 | 202.2 | 391.8 | 292.4 |

During these seven years there have been smelted, in all, 1,685.8 tons of copper, to the value of about 2,500,000 marks. The number of workmen engaged in the foundry, including the tin-smelting works, amounted last year to 682.

*Tin:* This metal is found only in the Pitkäranta mine, which, up to the present date, appears to be the only one in Eastern Europe, and in the whole Russian Empire, known to contain tin. As it happened with the copper product so the tin yield, which in 1862 amounted to 32.8 tons, fell in the following years so low, that in 1879 there were extracted in all not more than 2 tons of tin. In later years, the following quantities of this metal have been smelted:

|              | Year 1884 | 1886 | 1888 | 1890 |
|--------------|-----------|------|------|------|
| Tons . . . . | 12.2      | 17   | 19.4 | 13.4 |

*Iron:* The production of iron in Finland is based to a very slight extent on its mineral ores, inasmuch as the iron mines discovered in this country have for the most part proved sufficiently poor, and besides that, generally contain an ore that is by no means rich; consequently, these mines have little by little been abandoned. How the working of these mines has for this reason fallen off may be seen from the following returns.

| Y E A R.       | NUMBER OF MINES WORKED. | TONS OF ORE EXTRACTED. |
|----------------|-------------------------|------------------------|
| 1858 . . . . . | 16                      | 6,956.7                |
| 1860 . . . . . | 7                       | 5,108.7                |
| 1865 . . . . . | 9                       | 2,237.2                |
| 1870 . . . . . | 2                       | 528.4                  |
| 1875 . . . . . | 1                       | 471.3                  |
| 1880 . . . . . | 1                       | 242.5                  |

From the year 1875 only one mine has been worked a year, namely, the Kulonsuamäki mine, in the Newland government, where however the works were suspended in 1888; but in the following year, 1889, another mine, at Wälimäki in the Viborg government, on the banks of the Ladoga lake, was begun to be worked.

In the succeeding table are noted the yields of mineral iron ore for the last few years:

|            |           |      |      |       |       |
|------------|-----------|------|------|-------|-------|
|            | Year 1884 | 1886 | 1888 | 1889  | 1890  |
| Tons . . . | 125.5     | 90   | 46.2 | 1,030 | 4,335 |

The trifling quantity of mineral iron ore to be obtained in Finland would of itself exclude the existence of iron in that country, so far as it is based on native raw materials, if Finland did not enjoy other sources for the production of iron in the shape of its lake ores, which are to be found in its numerous waters. The formation of this ore is due to a chemical process, by which the indissoluble combinations of iron that enter into the composition of the mountainous beds and soil strata are decomposed and dissolved by the water in conjoint action with the atmospheric oxygen and carbonic acid; this solution being carried by the subterraneous springs to the beds of the rivers and lakes, where the carbonic acid is thrown off and the hydrous oxide of iron is precipitated. This ore assumes many and different forms, being sometimes in the shape of an irregular lump, and sometimes in the shape of a surface slice, that would cover a moderate-sized coin. The ore is dug out of the bed of the lakes by means of specially constructed instruments. The art of dressing lake ores was known to the pagan Finns, who were wont to smelt the iron in small forges, and convert it straight into wrought iron. In the present day lake ores are converted in ordinary blast furnaces into cast-iron. The quantity of lake ore obtained in different years is set forth in the annexed table.

| Y E A R.               | NUMBER OF LAKES. | TONS OF ORE. |
|------------------------|------------------|--------------|
| 1861 . . . ? . . . . . | —                | 30,750       |
| 1870 . . . . .         | —                | 50,775       |
| 1875 . . . . .         | —                | 74,122       |
| 1880 . . . . .         | —                | 36,902       |
| 1884 . . . . .         | 126              | 46,506       |
| 1885 . . . . .         | 61               | 29,477       |
| 1886 . . . . .         | 71               | 27,626       |
| 1888 . . . . .         | 132              | 34,813       |
| 1890 . . . . .         | 180              | 55,099       |

The falling off in the years between 1875 and 1880 is to be explained by the unsatisfactory state of the markets, and the consequent suspension of work in some of the factories belonging to Poutilov, a firm that depended exclusively on imports into the Empire. The decrease, both in the earlier period, 1884 to 1885, and later, arises from the fact that the hitherto unlimited right to import into the Empire, free from all duties, cast-iron that had been smelted from Finnish ores, was in the last year limited to the quantity of 400,000 pounds, equalling 6,557 tons per annum. Respecting bar-iron, which earlier was also allowed to be imported in any quantity into the Empire free of duty, a limitation was simultaneously made to the

effect that this same proportion of 400,000 pouds should be allowed to be imported on payment of a duty of 15 kopecks per poud. The excess from the year 1886, which during a period of five years, from 1886 to 1890, amounted to almost 100 per cent, is to be explained by the improvement that took place in the general economic state of the country, and the consequent increase in the demand for iron.

Lake ore is chiefly to be found in the eastern parts of the country. The work of digging the ore out of the lakes, and conveying it to the foundries, is chiefly undertaken and performed by the inhabitants of the villages in the neighbourhood of the foundries, and it forms by no means their least important source of livelihood.

In the same way, as the principal business of the iron forges of eastern Finland, which are situated in the interior of the country, is to dress the lake ore, the iron works of the south-western parts of the country mainly occupy themselves with the mineral ore imported from Sweden, a richer metal than the native ore, and moreover dug up with difficulty. Thus, in the year 1890 no less than 16,214 tons of Swedish ore were prepared and dressed in these foundries.

The amount of pig iron smelted in the different years is shown in the following table.

| Y E A R S.     | TONS OF SMELTED PIG IRON. | TONS OF PIG IRON PRODUCED FROM LAKE ORE IN EASTERN FINLAND. |
|----------------|---------------------------|---|
| 1852 . . . . . | 6,205.0                   | —   |
| 1872 . . . . . | 19,422.5                  | —   |
| 1876 . . . . . | 26,093.1                  | —   |
| 1878 . . . . . | 14,397.4                  | —   |
| 1885 . . . . . | 23,914.8                  | 13,304  |
| 1886 . . . . . | 17,383.6                  | 7,189.7   |
| 1888 . . . . . | 19,684.9                  | 11,308.8  |
| 1890 . . . . . | 23,749.5                  | 15,398.7  |

The causes of the decline in the produce for the years 1878 and 1886 have been already explained.

As has already been shown, a large quantity of pig iron is sent into Russia, but at the same time it is brought into the country from abroad. The following table shows the relative proportions of pig iron exports into Russia, and imports into Finland:

|                           | Year 1884 | 1885     | 1886    | 1888    | 1890    |
|---------------------------|-----------|----------|---------|---------|---------|
| Sent into Russia . . . .  | 4,366.7   | 4,555.7  | 4,444.5 | 5,558.9 | 6,418.1 |
| Imported into Finland . . | 20,918.4  | 10,862.5 | 4,662.9 | 3,998.6 | 8,345.4 |

The decrease in the imports for 1885 and 1886 is to be explained by the change which, as already mentioned, was made as to the export of bar iron. The pig iron imported into the country is used for two purposes. Swedish pig iron is used



in the iron works of south-western Finland for the production of bar iron. English pig iron is used in large quantities in the smelting foundries and in the engine-building works.

An idea of the amount of bar iron, fine merchant iron and sheet iron, that is dressed and prepared, may be formed from the subjoined figures:

|                          | Year 1885 | 1886    | 1888     | 1890     |
|--------------------------|-----------|---------|----------|----------|
| Tons . . . . .           | 17,387.4  | 9,994.0 | 10,134.7 | 15,226.5 |
| Of these tons, in forges | 5,074.0   | 3,521.3 | 3,372.4  | 4,346.7  |

The greater part of this product consists of bar iron, and its different kinds; a small portion consists of sheet iron, which is prepared in three rolling mills. In the year 1890, there were prepared 8,649.4 tons of puddling iron, and 2,333.7 tons of Martin iron.

To give an idea how far the production of iron is on a level with the local wants of the country, the following figures give, for several years, the exports and imports of bar iron, sorted iron, fine merchant iron, and sheet iron.

|                               | Year 1885 | 1886    | 1888    | 1890     |
|-------------------------------|-----------|---------|---------|----------|
| Tons exported into Russia . . | 18,883.5  | 6,223.1 | 4,435.8 | 5,796.4  |
| Tons imported from Russia . . | 3,324.5   | 4,744.7 | 8,929.9 | 14,693.5 |

Sheet iron forms a very considerable part of the imported iron, and in 1890, 4,813 tons of it were imported. The great increase in the quantity imported the last few years, it seems, is chiefly to be explained by the increased demand, for building and construction purposes, of a kind of sorted and special iron that is not prepared at home.

The general value of the gross product in this section is to be seen from the subjoined figures:

|             | Year 1885 | 1886      | 1889      | 1890       |
|-------------|-----------|-----------|-----------|------------|
| Marks . . . | 9,427,290 | 7,538,632 | 6,146,825 | 9,539,920. |

#### ENGINE BUILDING AND OTHER METAL INDUSTRIES.

The condition and state of engine-building works and smelting foundries in Finland in earlier years may be gathered from the following figures:

|                               | Year 1858 | 1866 | 1870 | 1876 |
|-------------------------------|-----------|------|------|------|
| Number of works and foundries | 9         | 14   | 13   | 15   |

Value of work turned out (marks) 630,000 1,320,000 3,210,000 5,700,000.

During the last few years the value of work executed amounted to the following sums:

|                                  | Year 1885 | 1886      | 1888      | 1890        |
|----------------------------------|-----------|-----------|-----------|-------------|
| Value of work turned out (marks) | 5,968,283 | 4,276,968 | 6,902,555 | 10,882,560. |

Many of the workshops in Finland serve also as shipwright yards, and consequently in the latest returns no difference can be made between ship building and

the special work executed in these workshops. In former days, when wooden sailing vessels were exclusively, or at any rate principally used for conveyance of freight, ship building was carried on to a very large extent in many localities in Finland, in consequence of navigation both on home and on foreign waters being so widely spread. The people of East Bothnia are, up to the present day, famous for their skill in ship building and in carpentry. Since iron ships have more and more replaced the old wooden vessels, most of these wharves have closed operations, and now wooden ships are almost exclusively built in village colonies for coasting navigation, along the Baltic Sea, or the gulfs of Finland and Bothnia. Such work is only casual, and therefore wharves of this class have a more or less temporary character.

To give an approximate idea of the extent of the work executed in these mechanical factories and workshops, it may be stated that, in 1890, there were amongst other works built in them, 28 steamers, altogether of 2,759 actual horse power; 32 transportable steam engines; 16 water pressure, and 74 land engines; in all of 3,274 actual horse power; 81 steam boilers; 4,541 agricultural machines and implements; 14 saw-mill engines; and 35 mill apparatus. The most extensive of these works is the firm of Crichton and Company at Abo, which in 1890 employed 671 workmen and turned out work to the value of 1,926,864 marks.

Besides private workshops there are also Government mechanical works, which execute very large orders, and were founded to supply the Government railroads. The following figures show the value of work executed in these Government railroad workshops:

|                | Year 1884 | 1886      | 1888      | 1890      |
|----------------|-----------|-----------|-----------|-----------|
| Value in marks | 892,223   | 1,115,194 | 1,124,910 | 1,700,619 |

In 1890 about 600 workmen were employed in these workshops. The further development of this industry depends upon the extension of the railway system, and increased traffic on the lines.

The engine-building industry in Finland far from corresponds with the wants of the country, and in spite of the rapid progress it has made within the last few years, is not on a level with the growing demand; and consequently, there has been a simultaneous increase in machinery imports. The following table has been drawn up for the sake of bringing out the corresponding proportion between the imports and exports of engines, machine apparatus and implements:

|                           | Year 1885 | 1886      | 1888      | 1890      |
|---------------------------|-----------|-----------|-----------|-----------|
| Value of imports in marks | 2,772,739 | 2,043,554 | 4,191,558 | 6,125,578 |
| Value of exports in marks | 422,592   | 148,590   | 154,113   | 394,664   |

The nail industry has made great progress, owing to the comparatively high duty laid in the 1886 tariff, as will be seen from the annexed figures:

|                                  | Year 1885. | 1886. | 1888.   | 1890. |
|----------------------------------|------------|-------|---------|-------|
| Tons of nails manufactured . . . | 1,409.500  | 989   | 1,970.2 | 3,257 |

But this amount by no means satisfies the local demand, and in 1890 there were imported into the country 593.8 tons of nails, to the value of 274,732 marks,

the export of nails in the same year amounting to 138.7 tons, to the value of 52,721 marks.

Of other workshops in connection with metallic industries must be mentioned the following: blacksmith forges and locksmith works, of which in 1890 there were 436, employing 1,013 work people, and executing work to the value of 1,090,145 marks; 80 gold and silver workshops, employing 268 work people, and executing orders to the value of 143,046 marks; 80 tin and sheet metal workshops, employing 411 work people, and executing work to the value of 684,485 marks; 81 copper workshops, employing 271 work people, and executing work to the value of 342,609 marks; 108 clock and watch workshops for setting up and repairing clocks ordered from abroad, employing 256 work people, and executing work to the value of 330,438 marks; and also one galvanic workshop, employing 33 work people, and executing work to the value of 174,000 marks. Altogether, in 1890, there were 864 workshops in connection with this branch of industry, employing 2,623 work people, and executing work to the value of 3,674,934 marks.

#### TEXTILE FACTORIES AND THE CLOTH INDUSTRY.

As far as the value of products is concerned, the textile fabrics come immediately after the forest materials and foodstuffs.

The first place among these is occupied by cotton factories. As the proportion of cotton imported from America and East India for use in the factories of Finland appears to be the surest standard of the development of this branch of industry, the following table has been drawn up to show the amount of raw material imported in different years:

|            | Year. 1666. | 1870.   | 1875.   | 1880.   | 1885. | 1891.   |
|------------|-------------|---------|---------|---------|-------|---------|
| Tons . . . | 933.4       | 1,389.2 | 2,341.4 | 2,975.1 | 2,629 | 4,118.2 |

The rapid increase in the amount of these imports during the later years, from 1886 to 1891, is shown in the subjoined table:

|                                     | Year. 1886. | 1888.      | 1890.      | Increase in<br>five years. | 1891.      |
|-------------------------------------|-------------|------------|------------|----------------------------|------------|
| Number of work-<br>men. . . . .     | 3,170       | 3,709      | 4,231      | 33 per cent.               | 4,266      |
| Value of products<br>in marks . . . | 10,294,670  | 11,994,205 | 14,517,926 | 41 > >                     | 14,915,934 |

This increase was chiefly the result of enlarged operations in the four factories that exist up to the present time, and besides which only one small factory has been opened during all this period. The largest of these cotton mills appears to be the one belonging to the firm of Finleyson and Company, of which mention has been made above, and that belonging to the joint-stock company, Forssa, which has also been already spoken of. The former of these two factories, during the years 1891 and 1892, opened a new spinning mill, in which a steam loom was put up, of 850 actual horse power, being by considerable the largest loom at work in the whole country.

The home production of cotton fabrics is not sufficient to supply local demands. The exportation of these goods for sale is restricted to the Russian Empire, the duty being at the rate of 70 kopecks per pound, to only 50,000 pounds, equal to 820,000 kilograms to be exported per annum; nor does the export of cotton fabrics ever exceed this normal figure.

The import of cotton fabrics for earlier years cannot be accurately stated, since in all the returns of imports from different parts of the Russian empire, thread and cotton fabrics of different kinds, cotton, flax and wool, are given promiscuously, since the different sorts were allowed to pass free of duty. In 1891, the value of imported cotton fabrics amounted to 5,591,308 marks, of which 3,468,495 marks formed the value of the imports from Russia, whilst these fabrics were exported to Russia to the value of 2,734,112 marks.

The woollen factories have during the last few years begun to occupy a more prominent place among the industrial establishments of the country. These factories carry out operations of two kinds. On the one hand, materials, sent for that purpose, are finished and made up; as for example, wool-spinning, the preparation of different materials and the dyeing and dressing of hand-work materials, as fulling, pressing, et cetera. These frequently form the principal operations of small mills and factories, and at the same time, are of more or less importance even in the largest mills. The other class of operations consists in the preparation of thread and materials upon the initiative of the factories themselves, for which kind of production foreign wool is principally used, since home-grown wool is generally too rough and short for the fabrication of fine goods. The import of wool, therefore, appears to be the most convenient standard of the activity of the factories in the preparation of woollen fabrics; and the following figures show the amount of imported wool:

| Year                                 | 1866.  | 1870.  | 1880.   | 1886.   | 1888.   | 1891.   |
|--------------------------------------|--------|--------|---------|---------|---------|---------|
| Quantity imported in kilograms . . . | 19,250 | 80,045 | 101,023 | 200,430 | 242,511 | 471,374 |

The following table is annexed for the sake of showing the state of the woollen industry during the last few years:

| WOOLLEN INDUSTRY.                 | 1886.     | 1888.     | 1890.     | INCREASE IN FIVE YEARS. | 1891.     |
|-----------------------------------|-----------|-----------|-----------|-------------------------|-----------|
| Number of mills. . . . .          | 12        | 12        | 16        | 33 per cent             | 17        |
| "    " workmen. . . . .           | 555       | 570       | 829       | 49 " "                  | 933       |
| Value of products in marks. . . . | 1,524,735 | 1,906,860 | 3,093,269 | 103 " "                 | 3,480,264 |

The export of woollen fabrics is very trifling. But on the other hand, woollen yarn was imported in 1891 to the value of 176,940 marks, and woollen materials to the sum of 7,095,613 marks, of which 2,379,559 marks form the value of goods imported from Russia. The local demand, therefore, presents a wide field for the future development of this industry.

There is in the whole of Finland but one flax mill, namely at Tammerfors. The production of native flax is not, however, sufficient to supply the quantity of the raw material required by the above-mentioned factory, after having supplied the demand for the home-weaving industry. Consequently, during the last few years, the factory has employed only four per cent of home-grown flax, and sixty per cent of Russian flax. The following figures show the quantity of Russian flax, as well as of hemp and combings, imported during the last years:

| Year       | 1882. | 1886. | 1888. | 1890. | 1891. |
|------------|-------|-------|-------|-------|-------|
| Tons . . . | 941   | 945   | 1,257 | 1,121 | 1,203 |

The operations of the flax mill have considerably increased during the last few years, as is evident from the following figures.

| FLAX INDUSTRY.                 | 1886.     | 1888.     | 1890.     | INCREASE IN FIVE YEARS. | 1891.     |
|--------------------------------|-----------|-----------|-----------|-------------------------|-----------|
| Number of workmen . . . . .    | 984       | 979       | 1,070     | 8 per cent              | 1,151     |
| Value of products in marks . . | 2,200,000 | 2,400,000 | 2,900,601 | 32 " >                  | 3,020,000 |

A considerable portion of the products of this factory is designed for exportation to Russia. The value of the exports to Russia for 1891, according to the returns that have been made, may be calculated at above 2,000,000 marks. In this same year, yarn was imported to the value of 454,015 marks, of which 423,627 marks represent the value of yarn imported from Russia, and flax materials to the value of 617,453 marks, of which 205,947 marks represent the value of the imports from Russia.

The knitting industry was represented in 1891 by 5 factories, employing 223 workmen, and executing work to the value of 658,409 marks.

Besides the above-mentioned manufacturing industries, the preparation of textile stuffs forms a widely spread home occupation among the peasantry. The chief object of this village handwork industry is to supply the necessities of the household, and at the same time, to a small extent, to provide articles for general sale. This industry is in some places followed and practised in a more regular and settled manner, and merchants or companies furnish the weavers with yarn and patterns, and buy the woven goods of them for subsequent sale. Of these hand-woven goods, cotton stuffs prepared in the suburbs of the cities Borga and Joensuu, cloth and knitted stuffs prepared at Nystad, flaxen and twilled stuffs prepared to the south of Oesterbotten, and horse hair rugs prepared at Borga and Uleåborg, are well reputed and much valued. It is impossible to give even approximately any calculation as to the extent of this house industry, but there can be no doubt that it has greatly increased within the last few years. The interest with which peasant women throughout the country learn hand weaving, and the eagerness with which they attend the schools that have lately been established for giving instruction in weaving, may be cited as a proof of the progress it is making. Nearly all these schools have been founded by private individuals or benevolent societies, but in virtue of a long existing

general law, they also receive a subvention from the Government, which exercises a certain control over their direction and administration. The following table gives the number of these schools for different years, as well as the amount of the subvention they receive :

|  | Years 1890. | 1891.  | 1892.  |
|--|-------------|--------|--------|
| Number of schools . . . . .              | 11          | 20     | 25     |
| Amount of Government subvention in marks | 17,300      | 22,400 | 28,500 |

The number of tailoring establishments in towns amounted in 1891 to 318, employing 1,520 workmen, and executing work to the value of 3,039,764 marks. Ready clothes were imported in the same year to the value of 2,185,081 marks, of which 1,155,899 marks represent the value of the imports from Russia.

These were in 1891 only two hat manufactories in the whole country, employing 112 workmen, and executing work to the value of 502,747 marks. In the 14 city trading establishments for preparing hats and caps, 65 workmen were employed, and the value of all goods prepared amounted to 69,903 marks. In the same year caps to the value of 229,773, of which from Russia to the value of 192,479 marks, were imported; and hats, to the value of 344,587 marks, of which were from Russia, to the value of 170,666 marks.

It must be remarked that a large number of caps and hats are also prepared in villages by home hand work. Winter sheepskin caps, more than any other kind, are prepared in this way. Villages also occupy themselves with making straw hats; and during the last few years measures have been taken to encourage this industry. Among such measures may be cited the establishment at Borga of a special school for instruction in making straw hats.

#### TIMBER INDUSTRY.

Forest products constitute nearly one-half of the value of Finnish exports. From this fact alone may be judged the peculiar importance of the place which wood and timber products, the chief of all its articles of commercial interchange, must hold in the industrial life of the country.

Saw mills occupy the first and principal place among these industries. Timber sawing has, during the second half of the present century, passed through several phases, the latest of which must be referred to the last five years. Up to about the year 1860, so long as scarcely any but water saw mills were at work, mills were necessarily constructed only in places where water power was most easily attainable. The timber-sawing industry was, therefore, at this time confined to a number of small mills in the interior of the country; the peasants, at the same time, sawing by hand a considerable number of beams for sale. When, between the years 1860 and 1870, the timber trade became much brisker, this mode of conducting it had to be changed, inasmuch as the transport of a large quantity of sawn timber over ground roads became difficult and involved too great a cost. The use of steam power rendered a change in this respect possible. Only within the boundaries of the Saima water basin, which offers excellent lake communication between the wide

tract of the interior provinces of the country and the seashore, was the old-fashioned mode of carrying on the timber industry continued. During this period large steam saw mills were erected in other parts of the country, along the low current of streams suitable for floating timber, and large capitals were often expended on their construction. The timber was often floated down from forests that lay at a great distance from these saw mills. This mode of carrying on the timber industry was the result of the geographical character of the country, since its numerous river systems opened up a cheap and natural way of timber transport.

But this mode of transport had one great inconvenience. Finland, with the exception of East Bothnia, has no long continuous rivers, and its waters take rather the shape of lakes, united one to another by streams of various length. Along these streams the timber beams are floated one by one, whereas in passing through the lakes they have to be bound together in rafts. The constantly recurring necessity of binding and unbinding the rafts greatly delays the delivery of the beams at their place of destination. Indeed, to float timber any very great distance takes more than one summer. When, towards the end of the eighties, the timber market, which had been depressed for a considerable period, began to improve, the instability of favourable conditions was borne in upon the mill owners by dearly bought and costly experience. It was, therefore, necessary to seize the opportune moment, and this was impossible under the then existing system of long floatings extending over more than one summer. The extension of the railroad system, about the same time, also contributed to bring about a change in the timber-sawing industry. The development of this industry within a recent period brought with it the establishment of a number of small steam saw mills, most of which did not continue their operations for any long time, near railroads and the water lines of communication, and in this way considerably circumscribed the sphere of its activity. At the same time, timber hand-sawing declined more and more each year.

The extent to which the Finnish timber industry has been developed within the last few years may be learned from the annexed table.

| TIMBER TRADE.                    | 1886.      | 1888.      | 1890.      | INCREASE IN<br>FIVE YEARS. | 1891.      |
|----------------------------------|------------|------------|------------|----------------------------|------------|
| Number of saw-mills. . . . .     | 245        | 253        | 341        | 39 per cent                | 355        |
| »    » workmen. . . . .          | 7,369      | 8,024      | 10,578     | 43   »    »                | 10,225     |
| »    » posts sawn. . . . .       | 221,266    | 243,885    | 312,506    | 41   »    »                | 319,530    |
| Value in marks of work executed. | 23,393,375 | 27,142,389 | 33,911,429 | 45   »    »                | 33,256,697 |

The decrease in value of work executed in 1891 was caused, as is to be seen, from the amount of production, by the fall of prices in the timber markets. Of the saw-mills at work in 1890, 166 were water mills, and 174 were worked by steam with 191 steam engines, in all of 4,505 horse power. The number of saw mills had, since 1886, been increased by 96 new ones, of which 27 were water, and 68 were steam mills. Of these, 78 are newly built; the others being old saw mills, mostly worked by water, which for a while suspended operations, but have now resumed work.

The question, whether the rapid development of the timber-sawing industry is balanced by the natural growth of the forests of the country, has not yet been unconditionally solved. There is no doubt that a like correspondence is not to be observed everywhere, but that on the contrary an excessive clearance of forests is to be remarked in many places. It is a well-known fact, supported by statistical returns, that the timber-sawing industry has begun of late to clear forests on a smaller scale than before. And thus, in 1891, there were sawn 11,641,294 beams, which leaves nearly 37 beams per standard, whilst the number of beams in 1886 amounted to only 6,949,415, leaving 31 per standard.

The central points of the Finnish timber-sawing industry are Björneborg at the mouth of the river Kumo, and Kotka, situated at the point where the river Kymmene falls into the sea. In both these towns up to two million beams are sawn a year, much of the timber being floated along these rivers from the interior of the country.

The number of workmen as given in the above table by no means includes all who gain their living by the timber-sawing industry. A large number of work-people, chiefly inhabitants of the villages around, find occupation in felling and carting the timber, and floating it down the rivers and across the lakes. It is, therefore, easy to understand that a slightly better or worse state of the timber market, with a consequently greater or smaller demand for timber, exercises on the well-being of the population the same kind of influence as a good or bad harvest.

Notwithstanding the important bearing which forest industries, and in particular the timber-sawing industry, have in the country, the higher branches of the industry are but little cultivated or practised. Although a portion of the sawn material is exported already planed, the export of timber in other more finished forms is very small.

The extent to which joinery has been developed may be seen from the following table.

| J O I N E R Y .                 | 1886.     | 1888.     | 1890.     | INCREASE IN<br>FIVE YEARS. | 1891.     |
|---------------------------------|-----------|-----------|-----------|----------------------------|-----------|
| Number of joinery workshops. .  | 165       | 187       | 218       | 32 per cent                | 223       |
| » » work people . . . .         | 806       | 919       | 1,318     | 63 » »                     | 1,432     |
| Value of products in marks. . . | 1,223,670 | 1,247,065 | 2,118,115 | 73 » »                     | 2,331,239 |

The rapid development of steam-joinery workshops is particularly remarkable. In 1887 there were but six, employing 284 workmen, and executing work to the value of 656,205 marks, whilst in 1891 there were already 13, employing 635 workmen, and executing work to the value of 1,567,084 marks. This increased activity is mainly to be attributed to a chance circumstance, namely, a temporary increased briskness in the building trade. But in general, the joinery industry is not adequate to the wants of the country. This is to be seen from the fact that in 1891 there were imported articles of the joinery and cabinet-making industries to the value of 539,989 marks, of which 337,420 marks represent the value of imports from Russia,



whilst exports valued only 117,168 marks, of which goods to the value of 113,844 marks were exported to Russia.

As will be seen from the following table, the manufacture of reels and bobbins has only within the last few years begun to be of any importance.

| J O I N E R Y.                 | 1886.  | 1888.   | 1889.   | 1890.   |
|--------------------------------|--------|---------|---------|---------|
| Number of factories . . . . .  | 1      | 2       | 2       | 3       |
| » » workmen . . . . .          | 49     | 148     | 222     | 349     |
| Value of products in marks . . | 90,200 | 276,000 | 536,000 | 602,600 |

All the products of this industry are intended for export.

#### CHEMICAL INDUSTRIES.

Of all the branches of Finnish trade, the chemical industries without doubt appear to be least developed, especially if one compares their condition with the stage they have reached in other countries.

As an article of export, dry distilled pitch occupies the first place among products obtained by chemical appliances. Subjoined is a table of the exports of this article.

| CHEMICALS.                | 1886.   | 1870.   | 1880.   | 1886.     | 1888.     | 1891.     |
|---------------------------|---------|---------|---------|-----------|-----------|-----------|
| Amount of hectolitres . . | 242,557 | 171,680 | 159,785 | 113,024   | 144,622   | 143,504   |
| Value in marks . . . . .  | —       | —       | —       | 1,619,762 | 1,446,220 | 2,019,056 |

Pitch is for the most part a product of village home industry, and at the present time is chiefly produced in the northern parts of the country. For a very long time the distillation of pitch has been an accessory occupation of great importance, and sometimes has been the sole means of making money. It is for the most part in exactly the same stage of incomplete development that it was in days long gone by. Pitch is nearly always distilled in so-called pitch pits, that is, funnel-shaped cavities composed of planked partition walls, covered on the inside with clay and generally made on the declivity of a hill in such a fashion that the pit rests, on one side on the hill, and is propped up on the other side by beams. At the bottom there is an aperture having communication with a drain pipe, through which the pitch flows. The resin is stowed in the pit in the thickest possible layers, and covered with brushwood and earth, so that the distillation may be effected without exposure to the air from without. The resin is chiefly exuded from forest

sapplings, the bark of which is previously stowed away for two or three years to accelerate the formation of the pitch.

Within the last few years, measures have been adopted by the Government to familiarize the population with more rational and scientific modes of pitch distilling, involving less destruction to the forests. But it is not likely that any real change will soon be effected. There is no doubt that a considerable number of distillatory vessels are already at work in the country, but there is no positive information as to the results of their introduction into Finland.

Only pitch is utilized in distilling operations in the so-called pitch pits, all other products formed during the operation of distilling, such as wood spirit, pyroxylic acid, et cetera, being quite lost. The latter, however, are collected in the new distillatory vessels, and for their further preparation in forms fit for sale, a factory was established at Uleaborg, which however did not commence to work till 1891.

Among the products of the chemical group the most valuable are soap, and other chemical preparations. This is shown by the following table.

| C H E M I C A L S.              | 1886.   | 1888.   | 1890.   | 1891.   |
|---------------------------------|---------|---------|---------|---------|
| Number of factories . . . . .   | 9       | 11      | 11      | 14      |
| » » workmen . . . . .           | 36      | 57      | 59      | 78      |
| Value of products in marks. . . | 342,065 | 482,275 | 792,872 | 869,253 |

Of these industries soap boiling is placed on by far the best footing. In the returns for 1891 are to be found 5 soap-boiling works, employing 46 workmen, and turning out goods to the value of 748,033 marks. The products are almost solely for home use, and the value of the soap exports did not amount to more than 5,400 marks, whilst the value of soap imports amounted to 145,172 marks.

The candle industry, which formerly flourished to a considerable extent, now scarcely exists at all in the country. In 1875, the principal candle factory was the one at Havis, which turned out 239,887 kilograms of stearine candles, 104,308 kilograms of palmatine, and 14,195 kilograms of tallow candles. But even then the trade was by no means on the footing it should have occupied. The general value of candle and soap-boiling products in 1886 was rated at 1,310,000 marks; in 1870, at 1,640,000 marks; and in 1876, at only 97,000 marks. In 1891, 450,785 kilograms, of candles were imported, almost exclusively from Russia, to the value of 665,069 marks.

Another of these chemical industries, the manufacture of matches, has also exhibited signs of decline. In former times matches formed a considerable article of export. The first of the then existing factories in the country, at Björneborg, was one of the largest of its kind in all Europe. The Björneborg matches were then in use in all parts of Finland, in Europe and in other countries. So late as 1870, no less than 40,160 cases of matches, each case containing 1,000 boxes, were exported;

but before 1875 the demand for them had decreased to 7,614 cases; and subsequently the export ceased altogether: so that now matches are manufactured solely for home use. Inasmuch as matches are not brought from abroad, no great change can be expected to take place in this particular industry. In 1891, there were in the whole country 14 factories, employing 594 work people, and manufacturing matches to the value of 582,269 marks.

Bone-turning mills, many of which have been opened on a modest scale in the form of a village house industry, are not characterized by any large turn-out of products, but deserve to be noticed, inasmuch as they are continually increasing in production, as will be seen from the following table.

| BONE INDUSTRY.                 | 1886.   | 1888.   | 1890.   |
|--------------------------------|---------|---------|---------|
| Number of mills. . . . .       | 18      | 15      | 16      |
| » » workmen. . . . .           | 64      | 114     | 101     |
| Value in marks of products . . | 136,350 | 255,265 | 368,516 |

From these figures there is also reason to suppose that this particular industry has a tendency to pass over from a house to a factory industry. The import of bone-dust, almost exclusively from Russia, in the year 1891, amounted to 825,030 kilograms, to the value of 99,030 marks; but there were no exports.

In the year 1891, there were 133 independent dyeing works, employing 286 workmen, and executing work to the value of 500,392 marks.

#### POTTERY AND STONE-CUTTING INDUSTRIES.

Owing to Finland being so rich in rock formations, its native stone, which mainly consists of granite, notwithstanding the difficulty with which it is worked, has long been generally made use of in the building industry. Thus, outside the country, and particularly in the capital city of the Empire, Finnish granite is often used as a building material. The quays of the Neva are constructed of this stone, which was almost exclusively brought over from the Pytterlaks granite quarries; and the Alexander Column, as well as the pillars in the cathedral of St. Isaac, at St. Petersburg, are famous instances of the use of this material. Another species of Finnish stone, the Ruskeala marble, is to be met with at St. Petersburg, both in the cathedral of St. Isaac and in the Marble Palace. For the last few years these quarries have ceased to be worked.

In general, the stone-cutting and polishing industries no longer occupy the independent position they held in former years; and it is only within a very recent period that a revival of this branch of industry is to be remarked. In the year 1891, about 560 workmen were engaged in it, and the value of work executed amounted to a little more than 600,000 marks. To what an extent this increased activity depended

on exports, is seen from the fact that in this same year unwrought stone was exported in the following proportions: granite and feldspar, to the value of 165,114 marks, hewn stone for paving and other kinds of wrought stone to the value of 164,503 marks; these exports being almost exclusively to Russia.

From the following table may be seen the amount of business done in the Finnish brick kilns.

| BRICK TRADE.                   | 1886.   | 1888.     | 1890.     | 1891.     |
|--------------------------------|---------|-----------|-----------|-----------|
| Number of kilns. . . . .       | 83      | 87        | 96        | 120       |
| » » workmen. . . . .           | 1,658   | 1,948     | 2,788     | 2,754     |
| Value of products in marks . . | 996,350 | 1,240,660 | 2,058,982 | 1,934,283 |

The brick industry is carried on solely with a view of supplying the home demand.

The annexed table will show the progress that has been made in the Dutch-tile, earthenware, and porcelain industries.

| CERAMICS.                            | 1866.   | 1876.   | 1885.     | 1886.   | 1888.     | 1890.     | 1891.     |
|--------------------------------------|---------|---------|-----------|---------|-----------|-----------|-----------|
| Number of factories . .              | 14      | 16      | 9         | 8       | 10        | 9         | 10        |
| » » workmen. . . . .                 | —       | —       | 483       | 449     | 590       | 607       | 619       |
| Value of products in marks . . . . . | 270,000 | 780,000 | 1,097,715 | 964,410 | 1,158,165 | 1,404,817 | 1,430,661 |

The decrease in these industries from 1885 to 1886 is explained by the cessation of exports into Russia; whereas the exports of 1884 amounted to 714,611 kilograms, and in 1885 to 624,693 kilograms, they fell in 1886 down to 444,144 kilograms, and from that date have remained on the same level, or a little lower. The exports fell in consequence of a duty of 30 kopecks per pound being laid on all earthenware goods exported into Russia, they having been up to that time free of duty.

The value of goods exported into Russia by these factories in 1891 amounted altogether to the sum of 263,461 marks; namely, Dutch tiles to the sum of 121,470 marks, and earthenware and porcelain goods to the sum of 141,911 marks. This branch of industry, consequently, had chiefly in view the supply of home markets; for which, however, it proved inadequate, since in the same year earthenware and porcelain goods were brought into the country to the value of 470,983 marks, of which sum 230,772 marks represent the value of goods imported from Russia.

The glass industry has also during the last few years suffered a temporary stagnation, and for the same reasons. Since 1886, only bottles can be exported from Finland into Russia free of duty, all other glass products being subject to a duty of 30 kopecks per pound. The following figures show the fluctuations in this industry.

| Y E A R.       | NUMBER OF FACTORIES. | NUMBER OF WORK-PEOPLE. | VALUE IN MARKS. |
|----------------|----------------------|------------------------|-----------------|
| 1866 . . . . . | 18                   | —                      | 490,000         |
| 1876 . . . . . | 13                   | —                      | 780,000         |
| 1885 . . . . . | 18                   | 653                    | 1,503,820       |
| 1886 . . . . . | 15                   | 666                    | 1,291,280       |
| 1888 . . . . . | 13                   | 595                    | 1,458,235       |
| 1890 . . . . . | 15                   | 918                    | 1,958,955       |
| 1891 . . . . . | 14                   | 847                    | 2,042,551       |

Thus, the value of exports in 1885 amounted to 1,021,570 marks, and in 1886 had already fallen to 714,024 marks, and though the exports in later years have risen, the increase has been restricted to the export of bottles.

As has been seen from the last table, the glass industry in Finland is intended for foreign trade; and, in 1891, there were exported, almost exclusively to Russia, bottles to the value of 974,269 marks, window glass to the value of 341,485 marks, and other kinds of glass to the value of 23,010 marks, amounting altogether to 1,338,714 marks. In the same year, glass goods were imported to the value of 774,927 marks, of which 201,308 marks represent the value of goods imported from Russia.

#### FOODSTUFFS.

Finland is so rich in running streams, and in rapids formed by them, that there has been no difficulty in setting up, at comparatively short distances one from another, water flourmills, each designed to supply a particular district of very small extent. In these mills, which are generally very primitive in their construction, grain is ground for the neighbouring peasantry. Besides these, a small number of steam flourmills has been erected within the last few years in some of the villages.

The grain produce of Finland is in no way adequate to satisfy the home demand. The imported grain comes for the most part from Russia in the shape of flour. In eastern Bothnia, and in the south-western parts of Finland, the grain produce, on the contrary, is in excess of the local demand, and this excess, mostly oats but also rye, is exported in an unground form, since Finnish grain, after it has been well dried in a cornkiln, is in great demand for sowing purposes. The position, therefore, which the Finnish grain trade occupies, sufficiently explains the reason why there is so little need of trading flourmills conducted exclusively on independent commercial principles. In the whole country there do not exist at the present date more than ten trading flourmills, the value of whose products in 1891 amounted to about 4,000,000 marks. The largest of them, apparently, is the Wassa steam flourmill, furnished with five steam engines, in all of 580 horse power, and whose products in 1891 were valued at 1,401,370 marks.

In 1890, there were 1,383 trading and village mills at work in Finland, with a staff of 1,752 workmen. Of these mills 1,288 were worked by water.

Two sugar-refining mills have for a long time been at work in Finland, the products of which are based exclusively on imported raw sugar. As experience has

proved, it is not sufficiently profitable to cultivate beet in this country. The products of the two mills vary from year to year in quantity, but at the present moment a sufficiently marked increase is to be noticed in them, as the following figures show.

|                                | Years. 1866. | 1871.      | 1886.      | 1890.      | 1891.      |
|--------------------------------|--------------|------------|------------|------------|------------|
| Number of work people. . . . . | —            | —          | 188        | 231        | 240        |
| Value of products in marks     | 3,690,000.   | 5,270,000. | 3,530,375. | 6,019,350. | 7,853,499. |

An increase so marked in these products cannot be explained solely by an increase in their consumption, but must be accounted for by the decrease in imported refined sugar, and this is made clear by the subjoined figures.

|  | Years. 1886. | 1888.  | 1890.  | 1891.  |
|--|--------------|--------|--------|--------|
| Quantity of imported refined sugar in tons | 5,887.       | 7,536. | 7,514. | 6,466. |

But, inasmuch as the change in the amount of imports far from corresponds with the change in the amount of products, there is reason to suppose that the consumption of sugar in the country must have materially increased.

According to the actual law, the distillation of brandy from cereals in Finland is only permitted when carried on under the strict control of the authorities, and on payment of a duty of 65 pennies on each litre of brandy containing 50 per cent of alcohol. The law is mainly directed against drunkenness, to diminish which a number of measures have during the last few years been adopted, partly by limiting the right to trade in spirituous liquors, and partly by raising the duty on the distillation of brandy. These measures have necessarily had an influence on the brandy-distilling industry. In the following table the amount of brandy distilled in Finland is set forth.

| B R A N D Y.                            | 1866.      | 1888.     | 1890.     | 1891.     |
|---|------------|-----------|-----------|-----------|
| Number of distilleries . . . . .        | 64         | 32        | 45        | 44        |
| Quantity distilled, in litres . . . . . | 11,282,000 | 4,043,000 | 7,860,000 | 7,498,000 |
| Number of workmen . . . . .             | 1,109      | 457       | 709       | 727       |

Although the distillation of brandy has thus constantly increased from its lowest level in 1888, which is to be explained by the increasing demand on the part of the population, it has never attained its former proportions.

An essentially different state of things is perceived in the returns from Finnish beer and porter breweries.

| BEER AND PORTER.                     | 1886.      | 1888.      | 1890.      | 1891.      |
|--------------------------------------|------------|------------|------------|------------|
| Number of breweries . . . . .        | 83         | 84         | 89         | 89         |
| Number of workmen . . . . .          | 954        | 1,110      | 1,306      | 1,411      |
| Quantity brewed, in litres . . . . . | 12,804,000 | 17,945,000 | 20,448,000 | 24,932,000 |

The consumption of beer is thus seen to have regularly and constantly increased.

The same increase is to be noticed in the tobacco industry of the country as is shown in the following table.

| T O B A C C O.                 | 1886.     | 1888.     | 1890.     | 1891.     |
|--------------------------------|-----------|-----------|-----------|-----------|
| Number of factories . . . . .  | 29        | 31        | 28        | 32        |
| Number of workmen . . . . .    | 1,179     | 1,417     | 1,713     | 1,837     |
| Value of products in marks . . | 3,834,295 | 4,424,585 | 5,145,177 | 5,790,517 |

### THE LEATHER INDUSTRY.

Skin dressing occupies an important place among the trades of Finland. With respect to this industry, it is necessary to speak first of the tanneries. The following table shows their number and the extent of their operations.

| L E A T H E R.             | 1886.     | 1888.     | 1890.     | INCREASE IN FIVE YEARS. | 1891.     |
|----------------------------|-----------|-----------|-----------|-------------------------|-----------|
| Number of tanneries . .    | 485       | 602       | 588       | 21 per cent.            | 615       |
| Number of workmen. . .     | 1,530     | 1,903     | 1,977     | 29 >                    | 2,035     |
| Value of products in marks | 7,052,360 | 8,258,735 | 9,875,283 | 40 >                    | 9,965,807 |

Properly speaking, three of the above mentioned tanneries, employing 325 workmen and executing work to the value of 3,251,800 marks, may be regarded as factories, whilst the remainder bear rather the character of trade stores. The largest and most important of the former is the sole leather factory at Uleaborg, belonging to Brothers Astrom. In 1891 there were 253 workmen employed in the factory, and the value of goods prepared amounted to 2,821,800 marks. Nearly all the raw hides required by the factory are imported, Brazilian hides being principally used, as well as large number of Russian skins. The import of hides will, therefore, to a certain extent, determine the condition of the leather industry. In the following table the number of tons imported is given for different years.

|               | Years 1867. | 1870. | 1880. | 1886. | 1888. | 1890. | 1891.  |
|---------------|-------------|-------|-------|-------|-------|-------|--------|
| Tons imported | 65          | 169   | 612   | 800   | 1,831 | 3,220 | 3,447. |

A large quantity of tanned leather is sent to Russia. In 1891, the value of these exports amounted to 1,838,470 marks; whilst the imports amounted to only 638,367 marks, of which 424,904 marks represent the value of the imports from Russia.

The actual condition of the harness industry is explained by the following figures, which, however, it must be remembered, refer only to towns, since there are no returns from the villages.

| S A D L E R I E S.              | 1886.   | 1888.   | 1890.     | 1891.   |
|---------------------------------|---------|---------|-----------|---------|
| Number of harness factories . . | 79      | 85      | 85        | 81      |
| > > work people . . . . .       | 185     | 241     | 550       | 495     |
| Value of products in marks . .  | 278,990 | 399,750 | 1,069,097 | 904,799 |

The sudden increase, as shown in the above return for 1890, is explained by the fact that in that year large stirrup and saddle leather works were opened at Uleåborg by Bröder Äström. In 1890 there were employed in these works 333 work people, and the value of the work executed amounted to 708,000 marks. In consequence of the bad state of the trade throughout the country, the staff of workmen was reduced to 235 in the year 1891, and the value of work executed fell to 607,500 marks. The export of harness articles is extremely insignificant; whilst the imports for 1891, mostly from Russia, amounted in value to 174,620 marks.

There were in 1891, in different towns of Finland, 524 boot and shoe factories, employing 1,344 work people, and turning out goods to the value of 1,496,327 marks. In the same year, shoe leather was imported into the country to the value of 1,050,165 marks, of which 510,636 marks represent the value of the imports from Russia.

#### WRITING PAPER MILLS.

Among articles of export, those of the writing-paper industry, bark pulp, paste-board and writing paper occupy the third place, coming immediately after forest wares and cattle-breeding products. In 1891, these goods constituted 8.28 per cent of the whole value of all the exports of the country. The writing-paper industry in Finland dates from an early period. Already in the seventeenth century a writing-paper mill had begun its operations in Finland, and in 1760 there were two such mills, in which the bark pulp was pressed by water power, and the form was worked off by hand. The first writing-paper mill furnished with a paper machine was founded in 1842 by the firm J. C. Frenckell and Son at Tammerfors; and between the years 1851 and 1853, a second, the Tervakoski mill, was opened. In 1858 the number of writing-paper mills rose to eight, and the value of their products amounted to 400,000 marks. But the writing-paper industry did not secure its due place till wood began to be used as a raw material in the manufacture of paper. Finland, rich in wood and water, possessed all the materials necessary in the two industries, wood rasping and paper-manufacturing, based, as the latter is, on the employment of the two constituents, bark pulp and cellulose. For this reason, when these two materials began to appear in the market, the writing-paper industry at once acquired an importance in Finland it had never before enjoyed.

The actual development of the paper industry during the last few years is, perhaps, best shown by the number of workmen employed in these paper mills; for, regarding the value of the product, there is an evident disparity in the returns given in by the different factories for the different years, arising from the fact that the bark pulp and cellulose are entered, partly as independent materials, and partly as raw materials for the manufacture of paper, and are therefore not included as separate ingredients in the general estimate of the value of the product. For this reason, the export returns throw light on the development of the paper industry, which has been but little effected by the home demand.

| PAPER INDUSTRY.                 | 1884.  | 1886.  | 1888.  | 1890.  | 1891.  |
|---------------------------------|--------|--------|--------|--------|--------|
| Number of work people . . . .   | 2,197  | 2,322  | 2,615  | 3,300  | 3,329  |
| Amount of exports in tons . . . | 18,527 | 19,338 | 25,957 | 34,548 | 33,131 |



In the year 1891, there were at work in the country 13 wood-rasping factories, employing 1,050 workmen, and executing work to the value of 2,741,069 marks; 5 cellulose factories, employing 252 workmen, and executing work to the value of 1,193,973 marks; 11 pasteboard and tarred paper factories, employing 191 hands, and executing work to the value of 950,707 marks; and 11 writing-paper mills, employing 1,836 workpeople, and executing work to the value of 6,897,878 marks.

In 1886 the conditions of the writing-paper export trade underwent a radical change. Up to that date, its products had been exported into Russia free of duty; but from this year a duty of 14 kopecks per pound was laid on bark pulp, and 80 kopecks per pound on all paper of the better sort. These measures, however, did not cause any decrease in the products of this industry, as had been the case in other branches of trade, since, though with no little difficulty, new foreign markets were found for the products of the writing-paper industry. In the mean time, the exports to foreign countries in 1885 amounted in value only to 88,000 marks. But, in 1886, they already reached the sum of 833,406 marks, and in 1887 amounted to no less than 2,328,422 marks. In 1891, 10,984 tons of bark pulp were sent into Russia and 2,039 tons were exported; 14,330 tons of pasteboard, writing-paper, and paper products were exported into Russia, and 5,778 tons were sent abroad. The export abroad of bark pulp for this year forms the maximum to which it has as yet fallen; whilst the export abroad of pasteboard and paper was less than the export in 1888, when it amounted to 7,038 tons.

### THE GRAPHIC INDUSTRIES.

The extent to which the typographical industry of a country is developed, serves in some degree, as an index to the level of intelligence to which its people have attained, and at the same time affords evidence of their love for reading. From this point of view, the industry possesses a peculiar interest. The following table refers to the number of printing houses in Finland:

|                                 | Year 1886 | 1888 | 1890  | 1891  |
|---------------------------------|-----------|------|-------|-------|
| Number of printing houses . . . | 39        | 42   | 52    | 54    |
| Number of work people . . .     | 699       | 828  | 1,021 | 1,071 |

It is not possible to estimate with any positive certainty the value of work executed in these establishments. In the year 1891, it was calculated to be 2,203,450 marks, of which sum 503,641 marks represent the value of paper employed. The average number of work people employed in printing houses in 1890 was 1 for every 2,331 inhabitants of the country.

The following table gives the returns for the lithographical industry.

| GRAPHIC INDUSTRIES.                           | 1886.   | 1888.   | 1890.   | 1891.   |
|---|---------|---------|---------|---------|
| Number of lithographical establishments . . . | 5       | 6       | 6       | 6       |
| Value of products reckoned in marks . . . .   | 230,120 | 347,645 | 463,546 | 524,032 |
| Number of work people . . . . .               | 174     | 187     | 229     | 234     |

## FOREIGN TRADE.

In reviewing the export trade of Finland, attention must be directed to its foreign trade and also to its trade relations with the Empire. The former has at various periods been influenced by radically divergent considerations; but, speaking generally, the changes it has undergone have up to the present time been mainly directed to the attainment of greater freedom in trade. In the first customs duty tariff, issued in 1812, the different articles allowed to be imported into the country were separately enumerated in a series of a hundred sections, a large number of them being at the same time subjected to a sufficiently high duty. The importation of all other articles was forbidden. The subsequent customs duty tariffs, from 1816 to 1822, were based on a new principle, nearly all articles, save those specially enumerated, being allowed to be imported; though in the last of these tariffs no less than 311 articles were prohibited. These strict prohibitions, of course, resulted in the contraband introduction into the country of the forbidden articles, and the prevalence of smuggling called forth more or less extensive modifications of the tariff, some of these modifications being only temporary, others lasting.

The war in the East, in 1854 and 1855, brought with it many sensible changes in the economic condition of Finland; and these years were marked not only by a complete stagnation in the foreign trade, but by enormous losses sustained by the commercial fleet of the country, which decreased in tonnage by nearly 60 per cent. On the conclusion of peace it, therefore, became absolutely necessary to take energetic measures for restoring the country to its former prosperity. For this purpose, among other measures, different temporary duties were imposed in 1856 on articles of foreign trade, and a new customs duty tariff was issued on April 30, 1859, in which considerable ameliorations were introduced into the system of customhouse protection that had hitherto prevailed. In this tariff all the articles that could be imported free were enumerated in 58 sections, and the duty was further lowered on many articles both of import and export, and with the exception of a few chemical products, the import of only eight of the articles formerly forbidden continued to be prohibited.

The years immediately following brought with them new troubles and calamities to Finland. In 1862 began a series of bad harvests, culminating in 1867 in a complete and dire famine. The cruel effect of these disastrous years on the material development of the country is best characterized by the fact that the population of the country increased during the four years 1860 to 1865 from 1,750,000 to 1,840,000 souls, but in the course of the three following years again fell to 1,736,000 souls. New remedies had to be sought to heal the wounds that had been inflicted on the country. Among the measures adopted with this end in view, was a revision of the customs duty tariff, all the changes made in which had the same tendency as those preceding it. Several duties already imposed were confirmed in the new tariff of 1869, and many important ameliorations were introduced in reference to imports. This tariff in all essential points remains still in force, and the main object of the two subsequent revisions that have been made was to increase and raise the customs dues. The most important change in principle was made in 1886, when the duty on pig-iron, sheet iron, various iron products, and all engines, was further increased. This last measure was taken with a view of protecting the engine-

building and iron foundries of Finland. Lastly, in 1888, the customs duties on certain foodstuffs were raised, particularly the duty on sugar, which was now fixed from 31.20 to 40 marks per 100 kilogram on raw sugar, and from 54.70 marks to 60 marks per 100 kilogram on refined sugar.

All the custom measures just spoken of were confined to imports from abroad; Russian goods, with the exception of sugar, molasses, grape wines, salt and tobacco, being admitted all this time into the country free of duty.

Exports from Finland into Russia had been regulated by special statutes of the tariff of 1812. In 1835 new instructions were issued, by which, for the protection of Russian manufactures and trade, the right of importing goods into Russia was considerably restricted. These instructions remained in force till the years immediately succeeding the war in the East, when, almost simultaneously with the issue of the customs duty tariff for 1859, new rules were drawn up, in virtue of which the right of Finland to import goods into the Empire was in many respects enlarged. These rules remained in force and unchanged for a little more than a quarter of a century, when, in 1885, fresh changes were introduced, in consequence of which the export of iron and iron wares, glass goods, except bottles, and leather, was partly restricted by being limited to a certain quantity each year, and partly by being subjected to a duty.

It has been necessary to give the above short sketch of the customs duty laws, by which the foreign trade of the country is regulated, in order to make the annexed table intelligible. In this table is shown the yearly average value in marks of the imports, exports and trade turnovers.

| YEARS.     | WHOLE AMOUNT OF IMPORTS INTO FINLAND. | PROPORTION OF IMPORT FROM OTHER PARTS OF RUSSIA. | Percentage on whole amount of import from Russia. | WHOLE AMOUNT OF EXPORT FROM FINLAND. | PROPORTION OF EXPORT TO OTHER PARTS OF RUSSIA. | Percentage on whole amount of export to Russia. | GENERAL EXCHANGE OF FINNISH GOODS. | PROPORTION OF EXCHANGE BETWEEN RUSSIA AND FINLAND. | Percentage on whole exchange of goods between Russia and Finland. |
|------------|---------------------------------------|--|---|--------------------------------------|--|---|------------------------------------|--|---|
| 1850—1852. | 31,970,000                            | 12,900,000                                       | 40  | 11,720,000                           | 4,170,000                                      | 36  | 43,590,000                         | 17,070,000   | 39  |
| 1856—1857  | 52,480,000                            | 24,000,000                                       | 46  | 17,280,000                           | 4,230,000                                      | 25  | 69,760,000                         | 28,230,000   | 40  |
| 1867—1869. | 68,620,000                            | 34,550,000                                       | 50  | 46,230,000                           | 25,710,000                                     | 56  | 114,850,000                        | 60,260,000   | 52  |
| 1870—1872. | 88,500,000                            | 39,000,000                                       | 44  | 61,100,000                           | 32,000,000                                     | 52  | 149,600,000                        | 71,000,000   | 47  |
| 1883—1885. | 131,610,000                           | 61,500,000                                       | 48  | 106,970,000                          | 44,090,000                                     | 41.3  | 238,570,000                        | 105,670,000  | 44.3  |
| 1886—1888. | 105,490,000                           | 47,130,000                                       | 44.7  | 81,640,000                           | 35,440,000                                     | 38.7  | 187,130,000                        | 76,560,000   | 42.5  |
| 1889 . .   | 133,480,000                           | 53,700,000                                       | 40.2  | 103,740,000                          | 36,570,000                                     | 35.6  | 236,220,000                        | 90,270,000   | 38.2  |
| 1890 . .   | 146,600,000                           | 47,260,000                                       | 33.7  | 92,420,080                           | 36,360,000                                     | 39.3  | 233,020,000                        | 83,620,000   | 35.9  |
| 1891 . .   | 146,530,000                           | 52,460,000                                       | 35.8  | 104,200,000                          | 36,140,000                                     | 34.7  | 250,720,000                        | 88,690,000   | 35.3  |

The increased activity in trade that marked the years directly following the conclusion of the war in the East is quite intelligible after the complete stagnation in the foreign trade of the country during the two preceding years. The exchange of goods in the year 1856 to 1857 was, in consequence of this, abnormally high, a proof of which is to be found in the decline of imports from 52,480,000 marks to 40,250,000 marks in the year 1858 to 1859. It would be erroneous to ascribe this great activity in trade solely to the exceptional reduction in the customs duty tariff for 1859. There were other favourable conditions, which gave renewed energy to every branch of public life throughout the country, and which accordingly contributed to a revived activity in trade and commerce. And, perhaps, more than to any thing else, this activity should be ascribed to the greatly increased export of forest materials from the country which marked these years. In this way, then, a still more increased activity in trading operations characterized the years following: and taking the average amount of exports, the total exchange of Finnish goods for 1869 must be reckoned at a figure higher than 100 marks per each inhabitant of the country.

That the Government, notwithstanding the reduction in customhouse dues, gained considerably from this increase in exchange of goods between Finland and Russia, is plain from the subjoined figures.

| Y E A R S.     | TOTAL CUSTOMS REVENUE IN<br>FINNISH MARKS | PROPORTIONATE PERCENTAGE IN<br>MARKS OF THE TOTAL REVENUE<br>FOR EACH INHABITANT OF THE<br>COUNTRY. |
|----------------|---|---|
| 1852 . . . . . | 4,900,000                                 | 2.9   |
| 1862 . . . . . | 7,700,000                                 | 4.3   |
| 1872 . . . . . | 8,400,000                                 | 4.5   |
| 1882 . . . . . | 15,300,000                                | 7.2   |
| 1891 . . . . . | 20,100,000                                | 8.4   |

Another circumstance well meriting attention is the proportionate relation at different periods between the exchange of Finnish and Russian goods, and the total trade turnover. The customs duty tariff for 1859 of itself caused a considerable increase in the exports to Russia, but simultaneously a corresponding increase in the imports from Russia is to be noticed, so that the sum of trade transactions with Russia for the years 1860 to 1885 fluctuates between 43 and 52 per cent of the total exchange of goods. The changes made in the tariff in 1885 caused a decline in exports, but at the same time a like decline is to be remarked in imports, so that the exchange of goods with Russia is equal to 35.3 per cent of the whole foreign trade of the country for the year 1891.

The following table has been compiled to make clear the position that different kinds of goods occupy in the foreign trade of the country. In it is shown the value of the exports and imports of different important articles of trade in marks, as well as their percentage value in relation to the whole export or import:

## MANUFACTURES OF RUSSIA.

| I M P O R T.   | VALUE IN<br>FINNISH<br>MARKS. | PERCENTAGE. | INCLUDED VALUE IN<br>FINNISH MARKS OF<br>IMPORTS FROM RUSSIA |
|--|-------------------------------|-------------|--|
| Grain, flour, and baking products. . .                             | 27,807,000                    | 19          | 23,914,000   |
| Coffee, and its surrogates . . . . .                               | 12,641,000                    | 8.6         | 426,000  |
| Sugar, and sugar products . . . . .                                | 7,563,000                     | 5.2         | 1,372,000  |
| Tobacco . . . . .  | 2,082,000                     | 1.4         | 1,108,000  |
| Spirits . . . . .  | 4,397,000                     | 3.0         | 52,000   |
| Hides and skins, with products . . . .                             | 6,270,000                     | 4.3         | 1,654,000  |
| Thread and yarn materials (wool, cot-<br>ton, flax, etc.). . . . . | 8,325,000                     | 5.7         | 1,463,000  |
| Yarn and thread . . . . .  | 4,227,000                     | 2.9         | 1,390,000  |
| Tissues. . . . .   | 13,452,000                    | 9.2         | 6,131,000  |
| Ready-made clothes . . . . .                                       | 4,123,000                     | 2.8         | 1,739,000  |
| Vegetable oils and fats . . . . .                                  | 4,527,000                     | 3.09        | 3,193,000  |
| Colours and dyeing articles. . . . .                               | 2,224,000                     | 1.5         | 34,000   |
| Mineral and pottery wares. . . . .                                 | 5,030,000                     | 3.43        | 779,000  |
| Metals and metallic wares . . . . .                                | 13,006,000                    | 8.9         | 681,000  |
| Machines apparatus. . . . .  | 6,126,000                     | 4.2         | 87,000   |
| Vessels and boats. . . . .   | 2,472,000                     | 1.7         | 7,000  |

| E X P O R T.                            | VALUE IN<br>FINNISH<br>MARKS. | PERCENTAGE. | INCLUDED VALUE IN<br>FINNISH MARKS OF<br>EXPORT FROM RUSSIA. |
|---|-------------------------------|-------------|--|
| Cattle . . . . .                        | 2,060,000                     | 2.0         | 1,573,000  |
| Cow butter . . . . .                    | 14,733,000                    | 14.1        | 2,950,000  |
| Fish, fresh, dried and salted . . . . . | 2,694,000                     | 2.6         | 2,086,000  |
| Bread and baking products. . . . .      | 7,077,000                     | 6.8         | 33,000   |
| Hides and skins, with products . . . .  | 2,596,000                     | 2.5         | 2,258,000  |
| Forest materials and wood products. .   | 44,784,000                    | 43.0        | 2,498,000  |
| Bark pulp and writing paper . . . . .   | 8,626,000                     | 8.3         | 6,839,000  |
| Yarn, and tissues . . . . .             | 5,182,000                     | 5.0         | 5,032,000  |
| Pitch, et cetera . . . . .              | 2,221,000                     | 2.1         | 268,000  |
| Stone and pottery wares . . . . .       | 2,051,000                     | 2.0         | 1,993,000  |
| Metals and metallic wares . . . . .     | 4,212,000                     | 4.0         | 4,181,000  |
| Vessels and boats . . . . .             | 2,029,000                     | 2.0         | 1,978,000  |

From the figures given above it appears that foodstuffs, such as grain, coffee, sugar, tobacco, spirits, make up the principal part of the imports of the country; for, taken altogether, they form in value 42.8 per cent of all the

imports. Next to them, in point of importance, comes the group of dry materials for the production of fibrous fabrics, textile stuffs, yarn and tissues, which constitute in value 20.6 per cent of the whole import. The third place is occupied by metals and metallic wares, machines et cetera, which equal 13.1 per cent, and including vessels, 15.8 per cent.

In value, the first place among exports, immediately after forest and wood materials, is occupied by cattle breeding, agricultural and fish products, amounting altogether to 27.2 per cent. Next come different trade products, among which those of the paper industry equal 8.3 per cent; those of the metal industries, including machines and vessels, equal 6.4 per cent; and those of the textile industries equal 5 per cent.

### THE FINNISH CUSTOMS TARIFF.

A general sketch of the historical development of the customs duty tariffs of Finland has already been given in the foregoing section. It has there been shown how, up to the very latest time, all the reforms that have gradually been made in the Finnish customs duty tariffs have constantly had one and the same end in view, to secure greater freedom for the foreign trade of the country, and consequently to diminish the extent of tariff protection of the home trade. Nor has this in any way acted injuriously on the commerce of the country. Notwithstanding the limited extent of this commerce even in the present day, it has none the less quickly developed, as is evident from the foregoing statement, and the progress it has made during the more recent periods is particularly striking; for it is exactly during these periods that it has received the minimum of tariff protection. There is evidently a great difference of opinion in the country as to whether its commerce could attain a still greater development under a more extended system of tariff protection; and the result of the prevailing system has been that the country does not possess sufficient direct experience of the possible effect of protective tariff dues.

None the less, as has been shown above, during the last few years, certain measures have been taken to increase the tariff protection, and in 1886 the duty on various iron wares was considerably raised. Thus, the duty on pig-iron was increased from 0.60 to 1.20 marks per 100 kilograms. The iron industry thereupon increased; but at the same time the amount of imported pig-iron rose to such an extent, that it is very doubtful whether the home trade derived any advantage from the increased duty on it. Up to the year 1886, the engine-building and machine industry of the country was in a very unsatisfactory condition, in consequence of metals and raw materials used in engine-building being subjected to duty, whilst machines and engines were admitted free into the country. This was also changed in 1886, when a duty was laid on engines and machines, and that on various iron wares was raised. There is no doubt that the engine-building industry of the country improved after this, and that from this time its products have essentially increased. But this is by no means the exclusive result of the increased duty, and it is evident from the figures given above that the increase in the importation of engines and other metallic wares has been the result of an increased demand for home purposes and home use.

The changes made in 1888 in the sugar duty have also been mentioned. The difference in the duty on raw and refined sugars formerly amounted to 23.50 marks per 100 kilogrammes; according to the present tariff, it amounts only to 20 marks. On this article, therefore, tariff protection has decreased; and yet, from that very date, the amount of refined sugar prepared in the sugar mills of Finland has each year been greater.

In considering the connection between the customs duty tariff of the country and the development of its industries it must not be forgotten that the trade of Finland does not, in this respect, depend entirely on whether the custom duties on its foreign trade be high or low, since Russian manufactures, with a few rare exceptions, are admitted free into the country. That this rivalry on the part of Russian manufactures exercises a considerable influence on the trade of Finland is evident from the list of imports already given in the table above. That part of the trade of the country, whose products are designed for exportation to Russia, depends also on the measures which at any particular period regulate its exports.

Below will be found certain returns intended to throw light on the actual customs duty tariff of Finland; and it has been thought well to tabulate the figures under different groups of industries, in accordance with the plan already followed in the review given of the trade and commerce of the country.

*Metal and engine-building industries.* Free of duty: ores, charcoal and coal, vessels above 700 tons, and rails for railroads. Duty per 100 kilograms: pig-iron, 1.20 marks; bar-iron and fine merchant iron, 6.50 to 9.40 marks; sheet iron, 5.30 to 6.50 marks; simple foundry goods and black forge work, 11.80 to 17.60 marks; fine foundry goods and metallic wares, 29.40 to 47.10 marks; nails, 14.70 to 17.60 marks; agricultural and dairy implements, 10.60 to 11.80 marks; machines, 14.70 marks; vessels under 400 tons, 4 per cent, and from 400 to 700 tons 2 per cent of the value.

*Tissues and textile fabrics.* Free of duty: cotton, flax, hemp. Duty per 100 kilograms: raw silk, 9.40 marks; wool, 3.50 to 7.10 marks; cotton yarn, 45.90 to 70.60 marks; flax and woollen yarn, 58.80 to 70.60 marks; silk yarn, 94.10 marks; cotton stuffs, 117.60 to 305.90 marks; woollen stuffs, 70.60 to 847 marks; flaxen stuffs, 70.60 to 705.90 marks; silk stuffs, 1880 to 4240 marks; dresses, 10 to 20 per cent. besides duty on stuff; stocking goods, 294.10 to 823.50 marks.

*Wood industry and wares.* Free of duty: forest materials, with the exception of a few costly and veneered woods, carpentry woods, simple wicker and cooper wares. Duty per 100 kilograms: precious woods, such as nutwood, mahogany, et cetera, 0.90 marks; veneered wood, 7.10 marks; toys, 117.60 marks; finer wicker wares, 47.10 marks; joinery and cabinet wares, 4.70 to 58.80 marks.

*Chemical products.* Free of duty: asphalt, bones and bone dust, manuring materials, tallow, stearine, train oil and other fat substances. Duty per 100 kilograms: alum, 2.40 marks; Chilian saltpetre, 0.90 marks; soda, 1.20 marks; saltpetre, 18.80 marks; muriatic and azotic acids, 2.40 marks; sulphuric acid, 4.70 marks; aniline dyes, 58.50 marks; dye woods 0.90 to 2.80 marks; dye stuffs, 17 to 82.40 marks; polishing varnish, 47.10 to 94.10 marks; fat oils, 11.80 to 35.30 marks; kerosene, 8.20 marks; turpentine, 4.70 marks; glue, 1.80 marks; cosmetic wares,

82.40 to 352.90 marks; candles and unscented soap, 21.20 marks; matches, 32.90 marks.

*Foodstuffs.* Free of duty: rye, barley, oats, wheat, buckwheat, flour, groats, peas, potatoes, and root chicory. Duty per 100 kilograms: pressed yeast, 12 marks; coffee and chicory, 40 marks; raw sugar, 40 marks; refined sugar, 60 marks; sweetmeats, 100 marks; fruit juices without sugar, 45 marks; raw tobacco in stalks, 40 marks; in leaves, 60 marks; cigars and papiroses, 500 marks; potato flour, 5.90 marks.

*Leather industry.* Free of duty: raw hides and skins, tan bark and tan extracts, hair and bristles. Duty per 100 kilograms: skins, 47.10 to 117.60 marks; bristle wares, 35.30 to 282.30 marks; boots, shoes, and harness ware, 141.20 marks; gloves, 641.20 marks.

*Ceramic wares.* Free of duty: cement, lime, gypsum, clays, unwrought stone. Duty per 100 kilogrammes: earthenware and porcelain goods, 11.80 to 141.20 marks; glass and crystal wares, 9.40 to 117.60 marks; pottery wares, 7.10 to 21.20 marks.

*Writing-paper products.* Free of duty: rags, paper size, bark pulp. Duty per 100 kilograms: tarred paper, 2.40 marks; paper, 41.20 to 176.50 marks; tapestry, 52.90 marks; countinghouse books, 141.20 marks.

#### HOME WATER WAYS AND RAILROADS.

Finland has been called «the land of a thousand lakes». Of its whole surface, extending to 6,027 geographical square miles, its home waters cover 757 square miles, that is, 11.2 per cent of the whole area. In Sweden, of all European countries the most rich in lakes, next to Finland, its home waters cover 8.2 per cent, in Switzerland 3.1 per cent, in European Russia 1.4 per cent, and in France only 0.3 per cent. These home waters present certain difficulties for navigation. In the lakes there are numerous shallows and rocks, and the rivers are intercepted by a number of rapids; for which reason they are in their natural form fit for navigation only for short distances.

The water systems of the country form five principal groups: the Saima, the Päijäne, the Vest-Tavastländska, the Oesterbotten systems, and lastly, the rivers and waters of the North Frozen Ocean. Only the first four have any great importance as ways of communication.

The Saima water system, the chief basin of which forms the lake Saima, at a level of 76 metres above the sea, flows through the river Wyoksi into the lake of Ladoga. This river abounds in very large rapids, among which may be mentioned the famous Imatra falls, and for that reason is unsuited for navigation. Some centuries ago, the idea was already started of uniting Saima with the bay of Viborg, in the Finnish gulf that runs out into the main land a distance of a little more than 40 kilometres from Saima; which plan was carried out in the middle of the present century, when in 1856 the Saima Canal was finished. This water route, which delights every voyager with its picturesque views, has altogether twenty-eight locks; its construction cost 12,400,000 marks, which sum, not counting the interest on it, had already in 1880 been covered by the net receipts of the passage tolls.



The construction of the Saima Canal involved the execution of different canalization works along the inner parts of the water system, in order to spread the navigable water routes over the largest possible distance within the country. The two principal lines must be separately noticed. The first runs to the town Kuopio, and thence farther on to Iisalmi; it has in its whole length of nearly 400 kilometres, reckoning from the northern extreme of the Saima Canal, Lauritsala, seven locks; and the construction of the line cost 2,600,000 marks, which sum has also been already covered by the net receipts from the passage dues. The second principal line, verging off from the first near the town Nyslott, runs up to the town Joensuu, and thence farther on across the *Pielis elfs kanaler* and the large lake of Pielisjärvi to the small town of Nurmes. This line, counting from the point of divergence from the first, is nearly 300 kilometres in length; it has ten locks in all; and its construction cost about 3,100,000 marks. Including expenses incurred on its different off-routes, the canalization of the Saima water system has up to the present date cost nearly 18,500,000 marks.

The Päijäne water system, named from its chief lake, which is 130 kilometres in length and 78 metres above the sea level, flows through the river Kymmene into the Gulf of Finland. A plan of canalizing this route was drawn up about the year 1860, but as its execution demanded a large capital, and the question of constructing a railroad between Helsingfors and St. Petersburg had already been mooted, the project was abandoned, and in its place the line was laid so as to touch the waters at the small town of Lahtis. By means of some unimportant works, requiring a capital of not more than 75,000 marks, including the construction of two locks, a continuous water route was cut to a length of 150 kilometres, not counting the branch route to the town Heinola. To the north of Päijäne stretches a number of wide lakes; the plan of uniting them with Päijäne has for the present been abandoned, it being intended to run a railroad across the country past the town of Iyväskylä.

The Vest-Tavastländska system, the principal mass of whose waters flows through the river Kumo and falls into the Gulf of Bothnia, has been opened up for communication in the same way as the Päijäne, that is, by bringing the railroad up to it at the towns of Tavastehus and Tammerfors, some canals at the same time having been excavated in the inner portions of the system. These excavations, together with the construction of four locks, cost 1,100,000 marks.

The Österbotten water system is of quite a different character to the three systems already described. Whilst the latter abound in a number of wide lakes, united one to the other by short streams, the lakes in the Österbotten system are comparatively few in number, and it consists rather of rivers, that have no very important basins; but inasmuch as these rivers are constantly intercepted by rapids, they are little fitted for navigation. The Uleå water system, with its principal basin of Uleåträsk, which is at a height of 122 metres above sea level, is the only one like the systems already described. This lake up to the present day has no way of communication either with the sea or with the network of railways. But the river Uleå is so far navigable that large boats can be run along it. A trip down the river in one of the so-called tar boats, thus named from the freightage they usually carry, is an enviable enjoyment for the tourist who desires to experience something new and exciting. With lightning swiftness the boat is carried along the foaming river,

and at times will disappear beneath its waves, only to come up again at a long distance from the spot where it sank. The voyage requires on the part of the steersman not only an accurate knowledge of the rapids, but the greatest care and coolness. One trifling mistake, and the boat, with all its freightage, must be for ever lost. For the sake of rendering the passage safe, sworn steersmen are stationed along the river Uleå. The boats are moved up the rapids by means of large boat hooks, or sometimes by towing ropes, or else are simply dragged up along the bank. The principal work, therefore, in making the Uleå navigable, consisted in constructing good towing paths, and in clearing the rapids of rocks. Along the rivers flowing from an easterly direction into the Uleåträsk basin, near the town Kajana, two locks have also been constructed. All the expenses incurred on works connected with the northern Österbotten water system amount to about 500,000 marks. In this way, about 21,000,000 marks have in all been expended in improving the means of communication on the home rivers and streams of the country.

All the railroads of Finland, with the exception of the Borgå line, 33 kilometres in length, at the present day are Government property. This is the result of no previously conceived plan, but has simply arisen from the fact that the construction of railroads in Finland is not sufficiently profitable to be made the object of private enterprise.

The construction of the first railroad in Finland, running between Helsingfors and Tavastehus, a distance of 107 kilometres, was begun in 1858 and completed in 1862. It cost in all 14,694,700 marks, that is to say, 137,300 marks per kilometre. Six years later, in 1868, the construction of the second Finnish line was begun, running from the station Rühimäki, on the first designed line, to St. Petersburg, a distance of 370 kilometres, and costing 27,525,280 marks, that is, 74,700 marks per kilometre. After its completion in 1870, four years elapsed before the commencement in 1874 of the third Finnish line, the Tavastehus-Tammerfors-Åbo line, which was completed in the year 1876. The cost of this line, 208 kilometres in length, amounted to 19,558,906 marks, that is, 94,000 marks per kilometre. In the meanwhile, in the year 1875, the Government purchased the Hangö-Hyvinge line, which belonged to a private company, and the construction of which had been already commenced in 1872. When later the question arose as to the necessity of extending the Finnish railroad system, it was maintained by many that it would be wiser to have recourse to a cheaper mode of construction, which should be more conformable to the small amount of traffic to be relied on in a country like Finland.

In order to arrive at a satisfactory decision on this point, a special commission was appointed. The result of its labours was the expression of an opinion in favour of maintaining the wide gauge of five English feet, decreasing the rate of train-speed, and reducing the expenses of administration on the different lines; besides recommending other like reforms. When, in 1879, the construction of the Wasa railroad was commenced, these suggestions on the part of the commission were put into practice. The result was that, when completed in 1883, the whole cost of its construction over a length of 306 kilometres was found to have been 14,771,832 marks, that is 48,270 marks per kilometre. Since the year 1879, the construction of railroads in Finland has been uninterruptedly continued on the general principles of the plan adopted in constructing the Wasa line.

The following table shows the number of railroads already opened, or being constructed, in Finland.

| LINES ALREADY OPENED.                 | LENGTH<br>IN KILO-<br>METRES | FIRST EX-<br>PENSES OF<br>CONSTRUCTION<br>IN MARKS. | SUPPLEMENTARY EXPENSES<br>OF CONSTRUCTION UP TO<br>1891 IN FINNISH MARKS. |                          |
|---------------------------------------|------------------------------|---|---|--------------------------|
|                                       |                              |   | Total sum<br>in marks.  | Amount per<br>kilometre. |
| Helsingfors-Tavastehus-St. Petersburg | 508.8                        | 42,219,980  | 56,605,742  | 111,244                  |
| Hangö-Hyvinge . . . . .               | 153.5                        | —   | 11,541,004  | 75,177                   |
| Åbo-Tammerfors-Tavastehus . . . . .   | 211.6                        | 19,558,906  | 21,233,847  | 100,867                  |
| Wasa . . . . .                        | 306.7                        | 15,771,832  | 16,155,988  | 52,669                   |
| Uleåborg . . . . .                    | 359.1                        | 19,700,528  | 20,195,893  | 56,244                   |
| Savolaks . . . . .                    | 337.7                        | 19,419,293  | 19,472,641  | 97,669                   |
| Total . . . .                         | 1,877.5                      | 126,230,345   | 145,210,114   | 77,342                   |
| LINES IN COURSE OF CONSTRUCTION:      |                              |   |   |                          |
| Wiborg-Ioensuu . . . . .              | 342.5                        | according to  | 24,315,000  | 70,991                   |
| Björneborg-Tammerfors. . . . .        | 135.8                        | estimate ditto                                      | 9,660,000   | 71,156                   |
| Total . . . .                         | 478.3                        | —   | 33,975,000  | —                        |

If the length of the railroad system be calculated in proportion to the population of the country, it will be found that for every 1,000 souls there are 0.778 kilometres, and for every 100 square kilometres of the areal surface of the country there are 0.490 kilometres. By a like calculation it will be found, that of the thirty-six towns of the country, with a total population of 226,689 souls, sixteen with a population of 128,476 souls, are provided with railroad communication, the other towns not having any at their disposal.

If again, the whole capital invested on railroad works in Finland be distributed over the whole period from the year 1858 to the end of 1890, it will be found that an average sum of 4,500,000 marks has been annually expended, giving a proportionate sum of 2.25 marks per year for each inhabitant of the country. The whole national debt of the country amounted at the end of 1890 to 82,126,697 marks, of which sum about 7,000,000 was not allotted to railroad works. The capital outlay on railroads during this period consequently exceeded the amount of the national debt by 63,083,317 marks, that is to say, by 72 per cent. The annual outlay in payment of interest and in sinking the national debt amounted in 1891 to 4,942,200 marks; the net receipts of working the lines amounted in the same year to 4,527,583 marks, that is, 3.12 per cent of the capital outlay; the net income thus amounting to 414,617 marks less than the annual amortisement of the whole national debt.

